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THE TRIDIMENSIONAL THEORY OF FEELING FROM THE STANDPOINT OF TYPICAL EXPERIENCES [1]

By W. S. Foster and K. Roese

This study is a supplement to the experiments by the method of paired comparisons made by Titchener [2] in 1902 and by Hayes [3] in 1906. The results of these experiments are later summed up as follows: [4]

"(1) Judgments of pleasantness and unpleasantness are direct, easy, and natural. The qualities themselves appear to the observers to be simple and homogeneous, identical throughout the experiments. Their opposite character is vouched for both by introspection and by the course of the curves.

"(2) Judgments of excitement are less direct, and the term is equivocal. If it is taken as the opposite of depressing melancholy, its curve agrees with that of pleasantness; if it is taken as the opposite of tranquility or soothing calm, its curve agrees with that of unpleasantness: the reverse curves then agree with those of unpleasantness and of pleasantness, respectively. If, in default of special instruction, the observer vacillates between the two meanings of the word, the curve shows a vacillating character,—partly 'pleasant' and partly 'unpleasant;' the period and nature of the affective oscillation are vouched for by introspection. Judgments of depression are, in their turn, distinctly less direct than those of excitement, and are often associatively mediated. There is no evidence of a dimension of excitement-depression, still less of a number of exciting and depressing qualities.

[1] From the Psychological Laboratory of Cornell University.
[2] E. B. Titchener, *Philos. Stud.*, 20, 1902, 382-406.
[3] S. P. Hayes, *Am. Journ. Psych.*, 17, 1906, 358-393.
[4] E. B. Titchener, *Lectures on the Elementary Psychology of Feeling and Attention*, 1908, 165 ff.

"(3) Judgments of tension are easy; but tension is described, throughout, in kinaesthetic terms. Increasing tension means, uniformly, increasing unpleasantness, and the curves of the two classes of judgment correspond. Relaxation may be taken as the opposite of unpleasant tension, in which case its curve agrees with the curve of pleasantness, or may be identified with depression. Nowhere is there evidence, in this third case, either of a new affective dimension or of specific qualities.

"Naturally, these results are not 'conclusive.' For one thing, the experiments are too few. For another, they were obtained in a single laboratory, and that a laboratory from which criticism of Wundt's doctrine had already proceeded. For a third, the argument upon which the experiments rest is not demonstrably valid. It would, I think, be a very strange thing if three sets of stimuli should affect a number of observers by way of excitement-depression (or tension-relaxation) precisely as they do by way of pleasantness-unpleasantness,—but nobody can prove that such a state of affairs is, on the plural theory, impossible. Were I a champion of affective plurality, I should unhesitatingly urge these objections to the work, and I have no desire to slur them over because I am on the other side."

We believed it worth while, therefore, to add to the number of the experiments; and also to introduce into the conditions of experiment certain variations which might make for results more favorable to the tridimensional theory, provided that the theory is valid, or might at least cast additional light upon the nature of the feeling qualities. We have, for example, obtained two observers who were not only quite unpractised, but were also entirely unversed in theoretical psychology, so that the charge of laboratory bias can hardly be brought against them. Further, we have given all observers concrete daily experiences illustrative of the feeling-dimensions in question, thus trying to avoid the ambiguity of purely verbal orientation, and in its place to set up not only a constant but also a correct standard for all six of the Wundtian quality-groups. Furthermore, we have asked for judgments of pleasantness and unpleasantness only *after* the series in the other dimensions were completed, so that previous practice should give no suggestion towards an identification of pleasantness-unpleasantness with other feelings.

Method. We used the same harmonical and the same series of twenty-four clangs employed in the former experiments (C-c, c^1-c^2, c^3-c^4). The c did not sound especially loudly, as it did in Hayes' experiments. We took the usual precautions in arranging the order within the stimulus-pairs. Hayes' and Titchener's curves, and repetition of our own depression and strain series in reverse orders, show that the order (higher tone first or higher tone second) makes in general little difference to the course of the curves obtained. The series in the other dimensions were therefore given but once, and then

in haphazard order, care being taken merely that no tone should be oftener the first than the second of a pair. We gave the stimuli of a pair in the same time relations as did Hayes: 'Ready,' interval 2 seconds, tone 2 seconds, interval 2 seconds, second tone 2 seconds. Five seconds were allowed between successive pairs in all series except the strain series, where the observers declared the observation to be especially fatiguing, and a 10-second interval was at their request adopted. Rests of approximately 2 minutes were given after every 20 pairs, and the observers then jotted down such observations as occurred to them.

Before the experimental series of a given dimension, an hour—and before the work of a given hour, a period of several minutes—was spent on special training, intended to make apparent exactly what was meant by the term designating the quality to be judged. For *depression*, the observers were taken several times from the light and shut for a few moments in a dark room.[5] They were told not to think especially of anything, but to give themselves up to the impression which the darkness should make upon them. This total impression they were told to understand as depression, and they were asked to judge the tones in the light of this experience. We hoped that in this way a depression in Wundt's sense might be secured, and might serve as a constant standard of judgment throughout the experiment. For *excitement* the observers were similarly brought from a dark room into the light. As a preliminary to the *strain* experiments, the observers listened attentively to metronome clicks given at three-second intervals, and were told that the impression of the waiting period was to be understood as strain. For *relaxation* the metronome was again used, and the observers were told that the impression given them by the coming of the click and at once thereafter was the impression in question. For *pleasantness* the orientation was given by the taste of a quarter-teaspoonful of sugar syrup, and for *unpleasantness* by the taste of a quarter-teaspoonful of a 0.1% solution of sulphate of quinine. Subsequent test-experiments, in which two observers were given peppermint and certain perfumes to smell, tickled with a camel's hair brush on the lip, shown saturated colors in the dark, asked to perform mental multiplication, etc., and to tell what feelings were aroused in these cases, gave results in close accordance with Wundt's statements,[6]

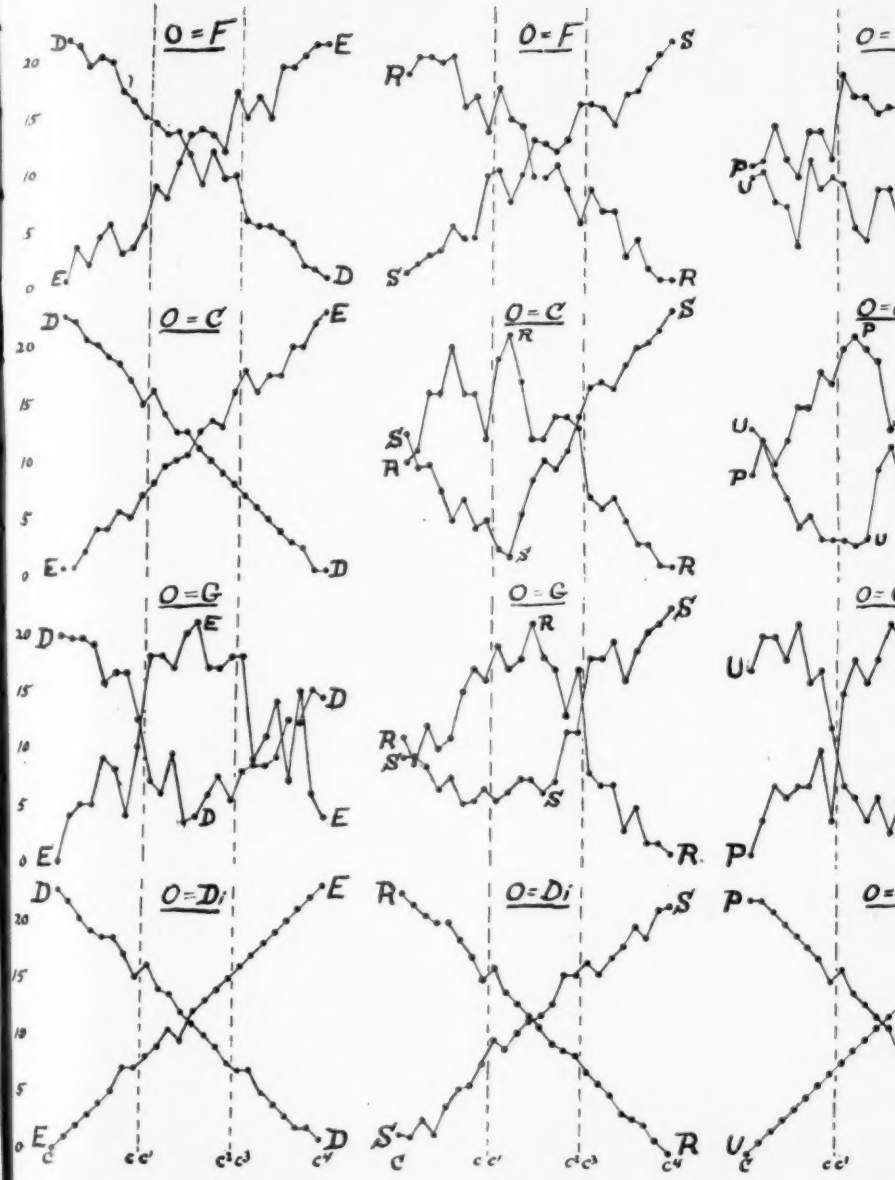
[5] See W. Wundt, *Grundzüge der physiol. Psych.*, ii, 1910, 295 ff.

[6] *Loc. cit.* The sole exceptions were that one observer called blue relaxing as well as depressing and pleasant, and red slightly straining as well as exciting and pleasant.

and indicated in a preliminary way that our illustrative experiences tended to give a correct notion of the nature of the six quality-groups. After the close of the complete experimental series for every quality-group, the observers were given a few repetitions of the regular and of the preliminary exercises, and were asked to characterize the impressions more completely, and especially to say what was common to both the preliminary experiences and the tonal experience, and to state (so far as possible) the basis of their judgment.

Observers. The one of us (R) served as experimenter throughout the experiment; the other (F) served as an observer, and is responsible for the formulation of results as expressed in this paper. The observers may be divided, on the basis of psychological knowledge and experience in psychological observation, into three groups. F, the writer, and Dr. J. N. Curtis (C), fellow in psychology, were highly practised observers; Mr. S. S. George (G) and Mr. F. L. Dimmick (Di), graduate students in psychology, had had considerably less practice. Miss E. Alspach (A), a senior, was forced to discontinue work after a single series on account of ill-health. Miss H. Hosmer (H) and Miss H. Kinnear (K) were freshmen with no psychological experience whatever. They had not even read a psychological text. The first four observers completed series in the order depression ↑, depression ↓, strain ↓, strain ↑, and then relaxation, excitement, pleasantness, unpleasantness, haphazard. The last two observers completed depression ↑, depression ↓, strain and pleasantness haphazard, and H at a later time also completed a second strain series.

Results. The curves for all observers are shown in Plate I. Single curves in the cases of D and S represent averages of ↑ and ↓ series. The use of the average is justified by the fact that under our conditions the ↑ and ↓ curves were quite similar; the average difference between corresponding ordinates of the curves for D ↑ and D ↓ was: for F, 1.3; for C, 0.3; for G, 2.7; for Di, 0.8; for H, 3.1; for K, 1.9. The figures for S ↑ and S ↓ were: for F, 2.1; for C, 1.5; for G, 1.5; for Di, 1.4; for H, 3.1. The greatest possible average difference (complete opposition) would evidently have been 11.5, and the least 0. If we express the general difference as a ratio of actual to possible difference, then F's D-curves have a general difference of 0.11; C's, of 0.03; G's, of 0.24; Di's, of 0.07; H's, of 0.27; K's, of 0.17; and the figures for the S-curves are F, 0.19; C, 0.13; G, 0.13; Di, 0.12; H, 0.27.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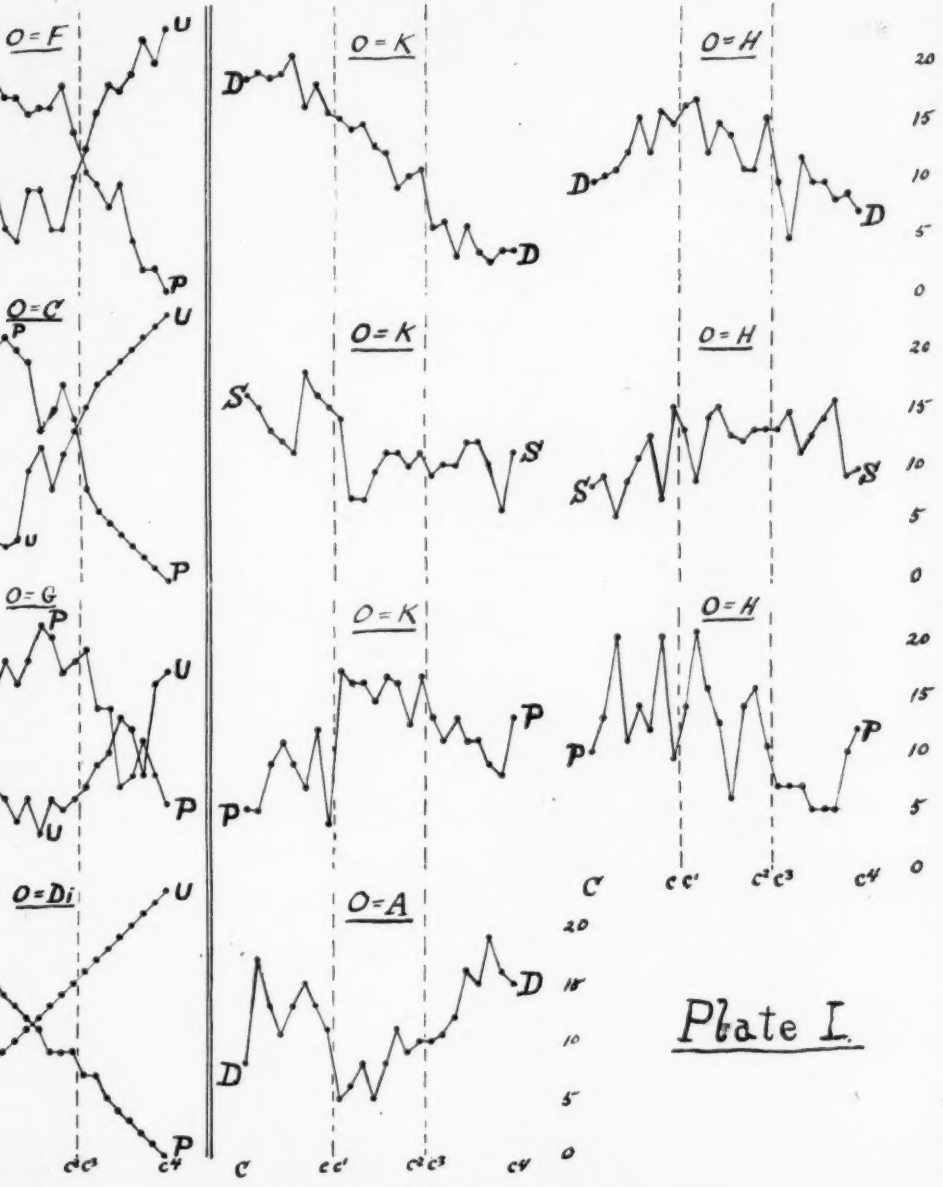
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Plate I.

The first fact to be noted, therefore, is the constancy of judgment of all our observers, where repetition of series involving a single quality-group is concerned. This constancy is greater than was obtained in a number of Hayes' series. The general difference of the P ↑ and P ↓ curves of Hayes' observer M, for example, even after considerable previous practice, is 0.96, and other large general differences may be found elsewhere in the work.

Secondly, from a glance at the curves of each pair of qualities, it is evident that under our conditions E and D, S and R, as well as P and U, are nearly exact opposites, a result which also did not appear uniformly in previous work.[7] We believe that for this outcome, as well as for the above mentioned constancy, our repeated orienting exercises are responsible.

Thirdly, we may point out that the curves which we have obtained belong in general to the types previously found. Inspection led us to believe that three typical pairs of curves could be made out. We may call them for convenience the X, the OX, and the XO pairs, exemplified respectively in the D-E pair of F, the S-R pair of G, and the P-U pair of G. For the sake of classifying doubtful cases, we further defined

[7] We may measure the degree of opposition as well as the similarity of our curves in terms of the general difference above referred to. Complete similarity is thus expressed by a general difference of 0 (=0/11½), neither similarity nor opposition by 0.5 (=5¼/11½), and complete opposition by 1.0 (=11½/11½). The expression of general difference, however, becomes more convenient if we transfer to a scale in which + 1.0 represents complete similarity, 0 neither similarity nor opposition, and —1.0 complete opposition. In general form, the steps in the method are then as follows: (1) sum up the individual differences of corresponding ordinates, taken without regard to sign; (2) divide this sum by the number of ordinates *times* the amount of the average ordinate; and (3) multiply this quotient by 2, and subtract the resulting product from 1.0. We have not as yet had opportunity to compare this method fully, either empirically or theoretically, with the standard methods of correlation. From the few cases in which we have made comparisons we get the impression that the Spearman method of rank differences and the foot-rule method especially, but probably the Pearson method also, in some cases at least give misleading results when used to measure similarity or opposition, as we here understand the significance of these terms. Even if this impression proves mistaken, our method finds a warrant for use in this particular case by merit of its simplicity. This question, and the question of the applicability of the method to other conditions than our own, we are forced to leave for future consideration. We may note further that we have measured by this method the oppositions and similarities stated by Titchener and Hayes in a number of possibly doubtful cases, and in every case the mathematical result verifies the judgments made by them on the basis of direct inspection.

these pairs in terms of the relative amounts of the sum of the ordinates within an octave.

If the order of these sums from left to right is great-medium-small (g-m-s), or small-medium-great (s-m-g), the curve belongs to the X type; if medium-great-small (m-g-s), or medium-small-great (m-s-g), to the OX type; if great-small-medium (g-s-m), or small-great-medium (s-g-m), to the XO type. The following Table shows the type-distribution of the 104 curves of our own and the previous experiments in terms of these six types:

		D	E	S	R	P	U	Total
X	g-m-s	12	3	0	9	10	0	34
	s-m-g	4	8	10	0	0	10	32
OX	m-g-s	2	2	0	2	4	0	10
	m-s-g	3	3	6	0	0	4	14
XO	g-s-m	4	1	1	0	0	1	7
	s-g-m	1	2	1	0	3	0	7
Total.	.....	24	19	18	11	17	15	104

This classification is, of course, to a certain extent arbitrary. By very definition it forces into a typical form, not only all our actual curves, but also all possible curves which we could have obtained. Its first justification (1) is that inspection led us to believe that a great majority of the curves fall into one of six such general forms. Only in a comparatively small number of cases was it necessary actually to compute the sums of the ordinates when determining their order. Still further justification for the classification, however, was sought. (2) After classifying the 104 curves according to type, we computed the average curve for each type, together with the mean variations of the 24 ordinates in each one of the six cases. Although a determination of the maximal variation possible without invalidation of type is undetermined (and, so far as our mathematical knowledge goes, undeterminable), the actual variations were so small that we consider them reliable evidence in favor of the existence of the six types. (3) Furthermore, small as were the mean variations, we were impressed by the fact that their amount was often determined, not so much by the large number of values closely approxi-

mating the averages, as by a few values which departed rather widely from it. We determined, therefore, to compute also the *median* deviation of the ordinates in every case; and thus, if these latter turned out to be less in amount than the mean deviations, to assure ourselves by this comparison that there was even greater evidence for the typical curve than the smallness of the mean variations indicated.

The results were astonishingly unanimous in confirming our impression. In the X pair, out of 48 (2x24) cases, the mean variation exceeds the median deviation in 45, and equals it in 2; for the same number of cases in the OX pair, the corresponding figures are 34+7, and for the XO pair, 39+4. In the total of 144, the mean variation exceeds in 118, equals in 12, and falls below in only 14 cases. Hence 0.82 (=118/144) may be taken as a rough representation of the tendency of our curves to cluster inside their mean variation from the typical curve.

The average mean variation of the g-m-s curve is 1.7, its average median deviation 1.2. Corresponding figures for its opposite (s-m-g) are 1.9 and 1.4. Less difference is apparent in the curves of the other pairs, though it still remains definite: m-s-g, 2.2 and 2.0; m-g-s, 2.2 and 1.9; g-s-m, 1.9 and 1.4; s-g-m, 2.4 and 2.1. This comparison, therefore, appears to us to show definitely a tendency of the individual curves to group closely about the average curve, thus justifying further our distinction of types.

Plate II shows the three pairs of average curves (the heavy lines). Above and below every ordinate of a curve its individual median deviations have been laid off, and these points have been connected by dotted lines. The space between the dotted curves thus formed, represents, probably more accurately than any other form of graphic illustration, the median range over which the variation from type takes place. The sum of the average median deviations for the six curves is 10.0. The maximal possible ordinate of our curves is 23.0. Hence $1 - \frac{1}{2} \times 10/23 = 0.78$ may serve to represent the definiteness with which our curves fall into six types.

We turn now to the introspective reports of our observers. As one reads them, their relevance to the corresponding curves (Plate I) becomes for the most part self-evident. We withhold interpretative comment here, remarking merely that many of our quotations are made from the introspections taken after a regular series was completed, because at that time general statements were practically required. It is to be remembered,

however, that such report was never given from memory alone, but was checked in every instance by actual experiment.

Depression and Excitement.

F. Darkness is "heavy, big, dull, inevitable." It "presses down on my chest and shoulders," and "seems to take the tonicity out of my muscles," "makes me feel quiet, subdued, passive, heavy," "throws me into a mood of 'don't care' or 'there's no use of doing anything.'" "The experience on the whole is rather pleasant." "Coming into the light gives me the feeling of 'lightness' and 'liveliness' or 'readiness,' the impression of heightened tonicity of the muscles." "My shoulders actually seem to rise and I feel lighter in weight." "This experience is also 'slightly pleasant.'" Judgments of depression and excitement with the tones are very easy. "The first stimulus merely puts me into a state, and the second 'lowers' or 'raises' and 'quiets' or 'arouses' me more or less than the first."

C. "Darkness makes me feel slow, subdued and serious." "It weighs me down like a weight on my shoulders and depresses me." The light made her feel "cheerful, springy, and light in weight, as if floating up instead of being pushed down." "Excited is too strong a word: it (light) is rather cheerful, quick, and to a slight degree pleasant." "The high tones aren't depressing at all." "The low tones sound almost the same way the dark room felt, i. e., they are serious, sober and subduing." "They are heavy and pressed on my chest, and made my breathing slower and deeper." (Afterwards remarks, however, that "all tones, even the low ones, are more cheerful than the darkness," and that "the low tones are pleasant and the darkness neither pleasant nor unpleasant.") Judgment, she maintains, is made on the basis of the change ('drop' or 'rise') of kinaesthesis in the chest.

G. Evidently takes depression and excitement in the sense of unpleasantly depressing and pleasantly exciting. "Darkness is sad, lonely and fearful, and takes control of me and makes me feel powerless." "The low tones are harsh and merciless, and shut close around you like the darkness, and they are sad and lonely." "I dislike them." "The middle tones give one a social feeling, and differ from the darkness in being pleasant and in not giving one a lonely feeling." "The high tones close in on one as the darkness does." "They seem lonely and distressing." "They are not unpleasant, but are like darkness sad and embarrassing."

Di. Found great difficulty in expressing the basis of his judgment in all six dimensions. He was at the time of the experiments also serving as an observer in experiments to determine the limens of pitch and volume of tones, and maintains that he could not entirely free himself from the 'sensory' attitude. "Cannot see that either low tones or darkness make more than a direct sensory impression on me." "They do not arouse what I should call feelings in me." "I cannot find any difference between the feeling before, during and after the tone, except in the direction of attention." "Would not ordinarily say that either the light or tones were in the least exciting." He "cannot see that the tones are like the darkness (or light) at all, except both are more or less big, diffuse, and roomy." This character is what he "has to understand depressing to mean."

K. "Darkness is heavy and solemn and makes me downhearted; is tiresome." "It is not quite boresome, but the *sameness* of it

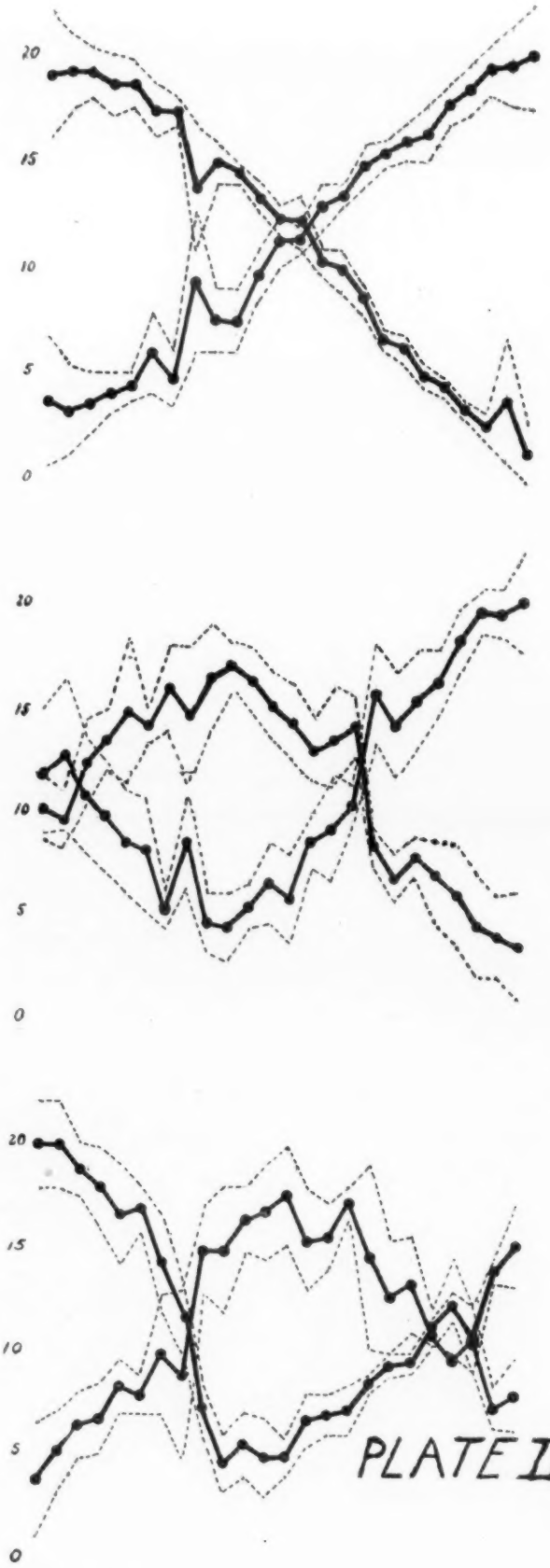

PLATE II

bores me." "The lower tones are mournful and deep and heavy." "They seem to fit in with the mood of the darkness." Medium tones "have a soothing effect and are a relief after hearing low tones." "They are more musical and pleasing." "Low tones have a tiring effect which medium tones do not have." "The high tones make me nervous." "They would seem out of place in the darkness, and generally have no depressing effect at all."

H. "Darkness seemed soft and heavy, and felt as if it belonged particularly to me," "rather inspiring." "It was not depressing particularly; not dreadful, but just serious. . . . In it I was happy in a quiet way." The low tones "seem far away and not so personal." "They are not at all inspiring and seem to run through and through me." "They seem thick and rough and blunt." "The medium tones seem nearer and more full of meaning." "They are more like the darkness than the lower notes because they are not so grasping." "The high notes are annoying and stick in my mind more unpleasantly."

A. "The judgments are hard to make because none of the tones press in upon me as the darkness did." "I seem to have to make my judgments on the basis of dislike."

Strain and Relaxation.

F. "Strain for me is attentive activity, tightness." "While waiting for a click I feel forced, held attentive." "The higher tones hold me attentive and strained." "This strain is 'thinner' than the strain of waiting, even though it may be more intense." "The strain seems localized primarily in my chest (holding breath or breathing tightly) and about my ears." "Relaxation is passivity, laxness, relief, freedom." "When the click comes, it lets me go, I sink down." "It is different from depression in that I am not *pressed* down, but 'drop' down of myself as far only as I want to go." "It is rather looseness, laxness, especially in the chest, and the fact of 'downness' doesn't matter."

C. "Strain is effort, tightness, tenseness, with irritation or impatience." "In waiting for a click there is a tension all over, especially in the muscles of breathing and around my eyes and ears." "The low tones are not accompanied naturally by strain." "In order to compare low or medium tones I have to institute a course of kinaesthesis, which resolves into the strain in my throat necessary to sing them; I have then to base my judgment either upon throat kinaesthesis or upon which tone I would prefer to have go on if one of them had to." "The strain of the high tones is much like the waiting strain in being irritating." "Aside from breathing, strain seems to be chiefly a matter of ear and throat kinaesthesis, the former in the case of high tones and the latter in the case of the low ones." "I can't get any general attitude except that of these strains and a sort of general irritation." "Relaxation judgments are much easier than strain, though not as easy as depression." "Relaxation is relief, restfulness, and a failure of any activity on my part." "It involves a general relaxation of the muscles which have been strained in expectation or by previous tones."

G. "Low tones are not straining at all; there is no impatience with them. You tend to exhale instead of inhaling or holding your breath, as you do in waiting for a click." "The [low] tones seem to press one down, and waiting and the high tones, to pull one up." "The muscles of themselves act independently of your activity in

listening to the tone." "The middle tones are pleasant and leave one normal." "I feel strain quickly if at all, but it takes some time for relaxation to come." "I seem to feel strain naturally, but relaxation is a secondary thing I have to tell myself to get. It is hard to keep the determination constant." "The [relaxation] judgment seems to me to be organic sensations and pleasantness."

Di. "Strain is expectancy, attentiveness, with strain sensations especially from respiration and in throat." "The tones simply came to me with strain or without." "The whole thing seemed very objective, the strain seemed to be the strain of the *tones*, rather than strain which I exerted." "Relaxation is simply lack of strain or less strain." "The more relaxing tone is the one which doesn't compel my attention." "There is nothing positive that I should call relaxation about the tones."

K. "The tones had the same effect as while I was waiting for the click. It was an impatient feeling, or as if something was still coming and I couldn't easily wait." "I am tense, and more or less impatient. There was a feeling of relief when it was over." "The middle tones didn't leave such a feeling of relief as the low or high ones did." "The more straining tone was the one which left the greater relief after it had gone."

H. "While waiting I feel tense, alert, nervous and annoyed." "The feeling was rather blank, but certainly straining." "The low tones do not seem to arouse much activity in my mind." "The middle tones produce the same feeling of strain [as the waiting] only less of it." "The high tones seem as if they might be straining, but some of them are too high for my mind to really sense them. They seem too small and indefinite." "I sometimes called the tone more straining if it left the greater feeling of relief."

Pleasantness and Unpleasantness.

F. Finds pleasantness "very hard to judge." "The sugar pleasantness is milder, smoother, calmer, evener, than the pleasantness of the tones, even the best of them." "It is hard to keep the affective set correct, or seems to be. The sweet made me tend to smile, and so do some of the tones more than others. . . . The pleasantness of the middle tones seems to me different from that of the low tones, though I can't say just how." Later: "Tremendously hard to judge between the moderately high and low tones. Both are slightly pleasant but the pleasantness seems different in the two cases: in the first, smaller and more definite; in the second, larger and more diffuse, somehow. In general, the pleasantness of the lower tones seems more like the pleasantness of the sweet." "The middle and lower tones are smooth, sweet and smilingly pleasant, like the sugar." "The pleasantness of the tones and sugar seems more in the tones and the sweet themselves than did depression, excitement or strain; the latter three seemed to be more my reaction." "The pleasantness seems to be more 'in my face,' and the depression, excitement and strain were more 'in my chest.' . . . I do not mean that I could localize absolutely definitely in either case." (In judging unpleasantness) "All tones except the very high ones seem pleasant, I have to translate them out of pleasantness-terms and say: 'This is less pleasant,' sometimes." "I think that even the high tones are not exactly unpleasant like the bitter, but rather unpleasant like sour. The low tones seem a little like bitter and sweet together, perhaps pleasant like chocolate." "Unpleasantness of the tones is more their

sourness than their bitterness. I can't make the high tones seem more than a little like bitter. They do tend to make me wrinkle up my nose and half sneer at them, somewhat as I tend to do at bitter and sour."

C. "Pleasantness [of sugar] seems like a warm glow over the upper part of my body." "The very first tone we had [*d*] felt just the same as the sugar." "It is quite hard judging between very high and very low ones. The low ones are diffuse like the pleasantness [of sugar] but they are also heavy and the pleasantness doesn't seem heavy at all. If I were going by the criterion of which I'd rather have go on, I'm sure I'd choose the low in preference to the high." Later: "Think I am set better than I was at first. I don't bother about all the stuff above. I simply don't like the high irritating tones, they seem to have a nasal twang that is unpleasant." "Pleasantness is more like relaxation than any of the other feelings we have had." "Unpleasantness is quite an easy judgment." "The bitter taste is quite unpleasant, so are some of the tones. Not sure whether it is the same unpleasantness. One big part of it seems to be kinaesthesis, only for quinine it is localized about my mouth and for the tones it is my whole body trying to get away." "The low tones are nice and cool."

G. "The sugar was not as pleasant as I thought it would be. What is more, I seemed to forget all about this pleasantness when I began to judge, and depended on my general attitude of pleasantness, rather than on that of the 'sugar pleasantness.'" "The sugar pleasantness was more or less too localized to be general pleasantness, which is more 'exciting' than that of sweet sugar." "The ['exciting'] pleasantness seems more to conform with that of the tones." "Unpleasantness is harder to judge than pleasantness. I sometimes feel at a loss and have to resort to all sorts of criteria other than unpleasantness, as straining, sad, shrinking, and all sorts of things." "None of the tones cause unpleasantness as we ordinarily understand that term." Later: "I am still having trouble with the judgment, as usually both of the tones are pleasant. The judgment comes to be merely the calling to mind of secondary criteria which the tones arouse, and calling these pleasant or unpleasant."

Di. "I am very dissatisfied with these judgments [of pleasantness]." "The pleasantness I am told to judge is not the same as I mean by pleasantness. Have to build up a criterion for the pleasantness of tones which is comparable to that of taste. The judgment seems to be not of pleasantness, but of which tone is sweeter." "The low tones have a heavy, almost sickly sweetness like honey. Big heavy tones sound like thick, rich sweets; I don't know why." Later: "Pretty sure that if I had been left to my natural pleasantness, I should have judged the tones by a different standard." "Unpleasantness gives the same difficulty as pleasantness." "Nothing in the tones like the bitter, but am trying to equate them." "I don't know what my basis is." "There is some tendency to pucker up my face [with high tones]."

K. "The medium tones are cheerful and pleasing like the sugar." "The low tones have a tiring effect. The high ones are so squeaky they make me a little nervous. They don't seem harmonious and aren't pleasant to hear."

H. "The low and medium tones are like the sugar because they are sweet and pleasant and soothe me. The sharp notes pierce me

and annoy me, and stick in my mind more unpleasantly than any. Some of them are so high they seem not to impress me at all."

After the regular experiments were completed, the four practised observers were asked: "What tastes are the following tones most like?" and were given the tones f^3, f^1, and F, each one several times over, with the harmonical. The f^3 was reported like "too strong a sweet" by G, and like sour by the other three observers. The f^1 was reported like sweet by F; like sweet and brown by C; like weak bitter by G; and like weak sweet by Di. The F was reported by F as like bitter and sweet; by C like sweet(?); by G. as bitter and flat; and by Di as 'sickish sweet.' Asked to arrange the feeling-series in order of the difficulty of judgment experienced, F arranged them (easiest first): Depression, Excitement, Strain, Relaxation, Unpleasantness and Pleasantness; C arranged them Depression, Relaxation, Unpleasantness, Excitement and Pleasantness, Strain; G's arrangement was Pleasantness, Strain, Relaxation, Depression, Excitement, Unpleasantness; Di called Strain the hardest, and the others all about equally difficult.

The summary and interpretation of the introspections must be prefaced by a comparison of our conditions with those in the experiments which it was our purpose to supplement. Titchener and Hayes in effect hypothesized the existence of the Wundtian feeling-dimensions. They oriented their observers generally only by single words, designating the qualities to be judged,—arguing that, with the stimuli used, the appropriate feelings should present themselves as bases of judgment, and express themselves in the production of typically different curves. We, on the other hand, have adopted another standpoint; we have taken for granted not Wundt's theory, but his observations. Working with this hypothesis, we have set our observers as definitely as possible within the circle of the experiences themselves, and have tried to ascertain whether or not the Wundtian theory follows. When the Wundtian feelings called for failed to present themselves in the previous experiments, a wide latitude of selection among bases of judgment still appeared possible in the Depression-Excitement and Strain-Relaxation dimensions. In our experiments, if we grant the correctness of the Wundtian observations, under the instruction and repeated suggestion to judge in terms of an empirical standard an observer has no such latitude of selection, but is definitely oriented for a given dimension, should have no difficulty in passing judgments on the basis of that

standard, and should give not only typically different curves for the various qualities, but also curves identical in type with those of other observers for the same quality.

But our hypothesis, too, receives no confirmation. To some observers, for some qualities, the tonal and the illustrative experience appeal apparently quite directly in a common aspect, and the judgment is accordingly easy. For other observers, and for other qualities, however, precisely the reverse is true: no common aspect can be directly found and the observer tends, contrary to instructions, to adopt either a more natural standard, or else some highly artificial non-affective standard of his own. Moreover, even when in the Depression-Excitement and Strain-Relaxation dimensions a common aspect is found, it is most frequently designated as pleasantness or unpleasantness, phrased in terms of secondary sensory concomitants, in terms of quasi-attributive character, or in both pleasantness-and-unpleasantness and sensory terms together. The illustrative experiences, that is to say, did not consistently make for ease of judgment. Often, especially in the pleasantness-unpleasantness dimension, exactly the contrary was the case. They did not produce uniformity of attitude among observers, nor bring into play the distinct bases of judgment to be expected. Unlike Titchener and Hayes, we find discriminable differences of attitude not only in the Excitement-Depression and Strain-Relaxation dimensions, but also in the dimension of Pleasantness-Unpleasantness. Why these latter qualities should, with different observers, give different curves, could scarcely have been asked by the earlier investigators, since their question was simply that of the number of typical affective curves for the single observer. In our case, however, this question is especially pertinent. A hint towards explanation is given, perhaps, by the fact that our observers speak of 'sickish,' 'sweet,' 'heavy,' 'warm,' 'cool,' 'big,' 'smooth,' 'localized,' and 'diffuse' pleasantnesses, and of 'bitter,' 'sour' unpleasantnesses, and that they also, after analyzing into sensory components the experiences to which these adjectives apply, speak of 'calming' and 'exciting' pleasantnesses, and of 'straining' and 'irritating' unpleasantnesses. The instruction to judge in the light of definite standards, which were at least partly sensory in character, seems to have disposed our observers to judge, not so much of affective values as of total sense-feeling values.

The question of the basis of judgment, however, cannot be dismissed by a mere reference to the possible diversity of sense-feeling. The fact which we were so particularly con-

cerned to bring out in the first part of our discussion of results, the fact that the curves of the observers in our own and in previous experiments fall into six types, arouses the suspicion that behind this uniformity must lie at least some community of attitude, some few specific sense-feelings, or some few other determining bases of judgment, masked as yet by the apparent heterogeneity of attitudes reported in the more or less incidental introspections. Despite repeated attempts to correlate the six typical curves with single factors or combinations of factors introspectively reported, we are for the present obliged to leave the matter quite unsettled.

We conclude our discussion of results by noting that the curves of our unpractised observers fall into the familiar types and show no distinguishing characteristic save a somewhat irregular course, and that the postponement of the pleasantness-and-unpleasantness series until the last appears to have made no difference to the curves obtained.

Conclusions

(1) We have approached the Wundtian theory of feeling from the standpoint of those determinate experiences which Wundt offers as typical of his three dimensions and six quality-groups. We find no evidence, either in the distribution of judgments or in the observers' introspective reports, for the correctness of the Wundtian theory.

(2) Our curves of distribution of judgments accord with those published by Titchener and Hayes. The whole set of 104 curves falls into three well-marked types of directly opposed courses. (Incidentally we have proposed a new method of measuring the likeness and unlikeness of such curves.)

(3) We have found evidence that the observers' basis of judgment is rather sense-feeling than affection pure and simple. We are not able, however, to correlate the three types of curve with three distinct sense-feelings or with three separable groups of such feelings. Future experiments must show whether this impossibility of correlation is inherent in the method of paired comparisons, as applied to the affective problem, or whether the method may be so refined, on the introspective side, as to furnish a solution of that problem.

We propose now to continue work with metronome-stimuli and systematic introspection. We shall thus be able to take account of the remainder of Titchener's and Hayes' curves, and to determine mathematically if metronome-curves fall into our three familiar types. We hope also, by making the introspective reports systematic rather than incidental, to ascertain the precise bases of the 'affective judgment.'

PRIMITIVE NOTIONS OF THE "SELF"

By Arthur J. Todd, University of Minnesota

I. Anthropologists as well as students of religion have been until recently almost unanimous in pronouncing primitive men anthropomorphic. Especially is this true since the Spencerian view of the origin of the idea of soul and of religion has been coupled up with Tylor's theory of animism as the basis of primitive religion. But much evidence exists and more is constantly coming to light to show that Voltaire's famous aphorism about man conceiving God in his own image, while perhaps true enough of highly developed peoples, is only half true or wholly false when applied to more primitive men. The savage does not feel himself the capstone of creation nor the 'measure of all things.' The idea of his supremacy over the beasts and other men comes perhaps from revealed religion, but it also develops with a growing experience of men and things. At first, however, he conceives the equal if not greater importance of many of the things he sees around him, things which have their own lives, interests, politics, and even fetiches. Notice, for example, the important rôle of animals as Culture-Heroes and as Creators in primitive myth. In other words, if we conceive savage mind as zoomorphic we shall strike nearer the truth. The reason is precisely this: that primitive men have a very confused, ill-defined, hazy notion of their "persons," their "selves."

If it be objected here that savages have such a superabundant sense of personality that they spill it over into the world of nature and work out vast animistic systems upon it, we simply reply that peoples standing low down on the culture-ladder are not strictly animistic, have only a vague, general notion of man's spiritual nature, and if they do project their images into Nature, derive only a nebulous sort of animism which is not really animism at all, but would better be called dynamism, energism, manitouism, or mysticism. It would not be difficult to show that many early travellers, discoverers and missionaries, on whom we must rely for much of our ethnographic material, projected their own preconceived notions of God, soul, spirit, into their interpretation of savage thought. For example, many of our North American Indians who were

set down as worshipping a "Great Spirit" had no real concept of a personal spirit. The missionaries caught part of the Indian idea of *manitou,* mysterious causal force, and personalized it as "Great Spirit." We shall offer further illustrations of this point later.

There is perhaps legitimate ground for making the philosophic distinction between personality and individuality. But since individuality develops first in the genetic order we are safe in saying that if the savage has but a vague sense of his physical individuality his notion of his 'person' is still more vague. That his sense of his physical self is vague cannot be doubted. Cuvier somewhere describes the first man as wandering about in ecstacies at the discovery of so many new parts of himself, till he gradually learns that they are not himself but things outside. Perhaps it is even truer that he regards integral parts of himself as things outside. This is a familiar phenomenon among lower animals. The cat plays with her own tail. My dachshund puppy worries his own front leg, bites it, groans, and apparently wonders why it hurts. Certain Euniceae (a group of Annelids) attaining a length of 1.5 metres bite the posterior extremity of their body without seeming in the least to feel it. For this reason apparently these animals voluntarily mutilate themselves when kept in captivity under disagreeable conditions.[1]

The human infant is many months in establishing personal ownership of his fingers and toes. That the savage is often equally backward in identifying himself with his own physical organism and feelings comes out strikingly in an account of Kafir childhood.

> "When a Kafir child has learned this first lesson (fear of fire) he has still much difficulty in recognizing the fact that his pains and aches arise within 'the frame that binds him in.' Take, for example, a headache. One of the most intelligent Kafirs I know told me that he could quite well remember his first headache during childhood. He said that he was conscious that something was wrong somewhere, but did not dream the pain was within his head. The pain might just as well have been in the roof of his hut as in the roof of his head; and it was only when his mother told him that his head was aching that the fact dawned upon him."[2]

[1] Ribot. Diseases of Personality (Open Court edition), p. 143, quoting Perrier, Colonies Animales. On the general obscurity of the term 'individual' among lower animals, see Ribot, *loc cit.,* 138-9; Espinas, Sociétés animales (2d ed.), Appendix ii; Bergson, Creative Evolution, 259-261.

[2] D. Kidd, Savage Childhood, 61-2. A public school teacher writes me that the same is true of many California children not entirely savage. "I've known," she says, "little chaps just beginning school to have 'an awful sore throat,' and then point to the region of the stomach for evidence."

Similarly the Lower California Indians in Father Baegert's narration could not or did not locate the trouble, when anything ailed them, but called every pain 'headache.' I am inclined to ascribe much of savage disease philosophy, not so much to a belief in evil spirits as causative agents (at least in the beginning), as to original failure to locate the seat of trouble in the sufferer's own person.

Such vague definitions of the physical "self" simply illustrate that lack of sharp dualisms which is the distinctive mark of primitive thought. It is difficult for a twentieth century Anglo-Saxon to seize and realize this primitive monism in all its comprehensiveness and vagueness. Perhaps I can best illustrate it from a symphony concert. If I can conceive myself as listener, music, orchestra, and conductor all in one, or interchangeable at will, then I have at least a glimmering of this phase of primitive mind. To a certain extent it is as guiltless of rigid dualism as the young child's mind, of which Professor Baldwin remarks:

> "Such consciousness seems to lack dualisms. It has no depth nor polarity. It is innocent of the distinction between what is in consciousness and what is external to it (the dualism of "inner and outer"), of the distinction of the subject that thinks and of the thing it thinks about (the dualism of "subject and object"), of the distinction between one thinker and another (the dualism of "self and other-self"—"ego and alter")."[3]

From his experience with the Kafirs, Mr. Kidd concludes: "There seems to be a tendency in the primitive mind to assign internal or subjective agency to phenomena due to external causes, and conversely to attribute external agency to effects which are due to subjective or internal causes."[4] Tylor states as a general principle that "even in healthy waking life, the savage or barbarian has never learnt to make that rigid distinction between subjective and objective, between imagination and reality, to enforce which is one of the main results of scientific education."[5] Major Powell once declared that the confusion of confusions in the minds of non-civilized men is the confusion of objective and subjective. And it is to terms of such psychologic errors and confusions that Professor Lehmann reduces the whole of primitive superstition and magic.[6] M. Lévy-Bruhl in his study of primitive mentality insists that savages do not conform to our logical discriminations between subject and object: "the primitive mind goes farther than merely to *represent* its object to itself: it *possesses* it and is

[3] J. M. Baldwin, Thoughts and Things, i, 46. [4] Savage Childhood, 62. [5] Primitive Culture, i, 445. [6] Aberglaube und Zauberei, 10, 316, 322, 324 ff., 537, etc.

possessed by it. It participates in it not only in the representative but at the same time in the physical and mystical sense of the word. It not only thinks it, it *lives* it." The identification or participation is so transfused with feeling, so imbedded in emotion, that it can hardly be said to be definitely thought.[7] This mystic monism is nothing if not thoroughgoing and consistent. Hence for many savages there is no such thing as a natural set over against a spiritual or supernatural world; neither are there any such mutual exclusions as " waking " and " dream " world, sacred and profane, matter and mind, object-as-such [8] and its properties or qualities.

In such a delightful yet at the same time miserably uncertain Alice-in-Wonderland world anything may happen; all things are possible. And this is precisely why even scientific observers with their concepts and categories make such a mess of interpreting primitive thought. Renan complains somewhere that we are wrong in applying our habitual methods to periods " wherein rivers have sons and mountains give birth." Professor Bain declares that " the leading fact in Belief according to my view of it, is our Primitive Credulity. We begin by believing everything; whatever is, is true." [9] Raise this dictum to the *nth* power and you reach the catholic and elastic quality that stamps primitive mind. How will you classify a mind that believes a man can be born of a rock, or that stones and grass can talk, fire not burn, the dead be dead and alive at once, or that a village is the child of a town?

However it is to be classified, such a mind is not wholly irrational, even though it carries a larger dose of emotion than we deem proper for rational thought. It is thoroughly consistent, at least in the sense that it focusses on a life policy—the will-to-live. It is logical according to its own pragmatic unconscious formulation of logic, viz., a logic of use. For example, the Rev. J. Jette says of the Ten'a that they " have a wonderful faculty for believing or disbelieving what they choose. Their intellect seems to be altogether at their will's command, ready to give or refuse its assent according to the

[7] Lèvy-Bruhl, Les fonctions mentales dans les sociétés inférieures, pp. 426, 67, 39, etc.

[8] For example, among Australians: Spencer and Gillen (Native Tribes of Central Australia, 697), speak of certain geometric drawings on their *churinga*. " Thus for example a spiral or a series of concentric circles cut on the surface of a certain *churinga* will designate a *nyassa* (gum-tree); but an exactly similar design cut on another *churinga* will represent a frog." Cf. Parkinson, Dreissig Jahre in der Südsee, 621-7, 234-5. This same phenomenon may frequently be observed in children's games and drawings.

[9] The Emotions and the Will, 511.

direction which it receives from the will. They never judge of the credibility of a report or statement on the merits of the case. . . . The ultimate reason which can be detected in almost every instance that really determines their belief is: what benefit shall accrue to me from such a belief?"[10] We must remember that not only the Ten'a but also civilized men, all of us, see not with our eyes, and hear not with our ears: we see with what we have already seen and felt; we hear what we have heard and felt before.

We need not be surprised, then, to find these uncritical minds rejecting such trifling distinctions as that between belief and knowledge. Such a mind does not *believe in,* say, ghosts or dreams or metamorphoses: it *knows* them; they are perfectly valid, normal experience. Beliefs and superstitions arise only when experience is questioned, when categories of natural, supernatural, etc., are set up. But at first all is natural. Hence we must not be unprepared to find the savage defining his "self" in terms of his name, his shadow, his soul, his feces, exuvia, property, family, clan-group, or other, to us, incongruous things and relations. For all these are *natural* parts of his person in his conception of all as natural. Furthermore, the principle of *totum ex parte* is a fundamental principle of primitive thought. Applied to the concept of self, it has been stated thus: the personality of a being is indivisible and resides in its entirety in each of its parts.[11] Hence the extreme solicitude of certain tribes for the clippings of their hair, parings of nails, feces, etc. Hence also such customs as the secret name or the taboo on the shadow. With these general principles in mind let us examine a few illustrations of the various elements which enter into the savage's concept of his self.

II. The name has been almost universally conceived as part of the self. "For all practical purposes the Kafir thinks the name is the man."[12] The Eskimo of Angmagsalik say that man consists of three parts, the body, the soul, and the name (atekata). The last enters the child when after its birth a sort of baptism is performed by rubbing water on its mouth and naming the name of the dead after whom the child is to

[10] *Journal of the Royal Anthropological Institute* (hereafter abbreviated as *JAI*) xxxvii, 158-9.

[11] Hubert and Mauss, Esquisse d'une théorie générale de la magie, *Année Sociologique,* vii, 62. Lippert in his discussion of fetichism, especially the Royal Person as Fetich, and the statue of the god or king as fetich, states the same general principle. (Kulturgeschichte, ii, 438, 466 ff.)

[12] Kidd, Savage Childhood, 72.

be called. When a man dies the *atekata* remains with the body in the water, or in the earth until a child is named after him. It goes then into the child and there continues its existence.[13] Sayce says of the Babylonians that name-giving was an important event in the child's life. "Like other nations of antiquity the Babylonians conformed the name with the person who bore it; it not only represented him, but in a sense was actually himself." A corresponding belief is hinted in the Chaldean oracle, "Never change native names."[14] Closely connected with the name as self is the common belief in the 'power of the word' and the word as a person.[15]

The shadow as part of the self is almost equally common. "It strikes one as strange at first," says Miss Kingsley of the West African negroes,[16] "to see men who have been walking, say, through forest or grass land on a blazing hot morning quite happily, on arrival at a piece of clear ground or a village square, most carefully go around it, not across, and you will soon notice that they only do this at noontime, and learn that they fear losing their shadow. I asked some Bakiwari I once came across who were particularly careful in this matter, why they were not anxious about losing their shadows when night came down and they disappeared in the surrounding darkness, and was told that that was all right, because at night all shadows lay down in the shadow of the Great God, and so got stronger. Had I not seen how strong and long a shadow, be it of man or tree or of some great mountain itself, was in the early morning time? . . . Murders are sometimes committed by secretly driving a nail or knife into a man's shadow, and so on;

[13] Hartland, Primitive Paternity, i, 218, after von Adrian and Holm.

[14] Babylonians and Assyrians, 44. Similar evidence from other peoples: Mooney, *7th Bur. Ethnology*, 343, 352; Ellis, Ewe-Speaking Peoples, 98-9; Rivers, The Todas, 627; Chamberlain, Things Japanese, 4th ed. 344; Spencer and Gillen, *N. T. C. A.*, 227; Hill Tout, xxxv *JAI*, 152; *Jour. Asiat. Soc. of Bengal*, iii, 20; DeGroot, Religious Systems of China, i, 212; Levy-Bruhl, Fonctions mentales, etc., 45 ff.

[15] Certain taboos on words, secret languages, use of formal prayers, rituals in archaic languages, inscriptions, spells, benedictions, curses, formulas, incantations, common in primitive life are expressions of the old belief that the description or mention of an act suffices both to produce it and its effect. "Speech if uttered in a whisper is breath, if spoken aloud it is body," said the Upanishads. (Sacred Books of the East, i, 231). Survivals of this ancient philosophy occur in contemporary religion. A Jesuit writer in *Contemporary Review* for January 1897 says: "Sacramental words according to Catholic doctrine, are words of power." Lafcadio Hearn has left a curious instance of the power of the word as a person. In old Japan the dragon-character once became an actual dragon. A man who had ridiculed the form of a certain character, likening it to a 'swaggering wrestler' awoke in the night under a terrible pummeling, only to find that the pummeler was the letter he had laughed at. A similar episode centers about a man who laughed at the rice-character. (Glimpses of Unfamiliar Japan, i, 32-3).

[16] West African Studies, 176.

but if the murderer be caught red-handed at it, he or she would be forthwith killed, for all diseases arising from the shadow soul are incurable. No man's shadow is like that of his own brother, says the proverb." A high-caste Brahmin becomes unclean if the shadow of a man of lower caste falls upon him. Chinese burial ceremonials noted by De Groot illustrate the same sentiments. "When the lid is about to be placed on the coffin, most of the by-standers not belonging to the nearest kindred retire a few steps, or even make off for the side apartments, as it is dangerous to health and detrimental to good luck to have one's shadow enclosed in a coffin. . . ." "They now lower the coffin into the grave, the principal mourners wailing and stamping their feet an unlimited number of times." Most of the by-standers recoil a few paces lest their shadows should fall into the grave and harm thus be done to their persons. . . . The geomancer and his assistants are wise enough to stand on the side of the grave which is turned away from the sun."[17] "A Kafir cannot always distinguish between himself and his shadow. Thus he is angry when a man—or even a child—stands on his shadow, for it is much the same thing as standing on his body. It will be observed that when a native approaches a number of men who are sitting down, he is careful to avoid treading on their shadows, or even tries to prevent his long shadow being seen in comparison with their short ones. This is especially the case with inferiors approaching their betters. . . . It is thought that a sick man's shadow dwindles in intensity when he is about to die, for it has such an intimate relation to the man that it suffers with him. . . . Native doctors apply medicine to people's shadows as well as to their bodies. . . . The shadow of a tree is said to feel the touch of the man's feet. And if the shadow of a tree is regarded as an organic part of the tree, how much more must the shadow of a man be considered to be a part of a man's personality."[18]

European folklore and mediaeval poetry reflect the popular superstitions regarding the shadowless man. Chamisso in his famous tale *Peter Schlemil* exploits these ideas. Schlemil barters his shadow to the devil for a magic purse of gold. He becomes forthwith an outcast through popular suspicion and fear of the shadowless man. He finds his shadow running loose one day in the woods, pursues and catches it, but is later compelled by the devil to relinquish it. Henceforth he must go without it for good and all. Cruikshank's illustrations show how a shadow may be detached, folded up or chased in quite the primitive fashion, and add strikingly to enforce the concept of the material substantiality of the shadow. (See the illustrated edition in Putnam's Ariel Booklets Series.) The play of present-day American school children indicates that these old ideas still survive in dramatic vigor. Many a child has been thrown into a paroxysm of fear and crying because a bullying comrade brutally stepped on his shadow.

[17] Religious Systems of China, i, 94, 210, 211.
[18] Kidd, Savage Childhood, 68, 70, 71.

Again, the image, "likeness" or picture, are identified with the self. To quote once more Mr. Kidd: "The raw Kafir has, as a rule, the greatest objection to having his photograph taken. He considers his 'likeness,' as he calls it, a part of his personality."[19] I have encountered the same belief among certain Indians of Western Nevada. I asked the women to allow me to photograph themselves with their babies, but was refused, from fear that I would take away part of their "selves" in my little black box: by the principle of *totum ex parte* I might work magic on the part and hence injure the whole of their selves. I was more fortunate than some students in America and other parts of the world in not having my camera smashed for my pains. More than once Catlin had much difficulty in clearing himself of the charge of evil magic while painting his North American Indians, all on account of this notion of the image-self. The Mandans, he wrote, "pronounced me the greatest *medicine-man* in the world, for they said I had made *living beings*,—they said they could see their chiefs alive in two places—those that I had made were a *little* alive—they could see their eyes move—could see them smile and laugh, and that if they could laugh they could certainly speak, if they should try, and they must therefore have *some life* in them. The squaws generally agreed, that they had discovered life enough in them to render my *medicine* too great for the Mandans; saying that such an operation could not be performed without taking away from the original something of his existence, which I put in the picture, and they could see it move, could see it stir."[20]

Survivals of this old belief in the image-self occur in certain modern religious customs—the icon; miracle-working pictures of the Virgin, of Christ, of the saints; medals, scapularies, images; and until recently processions with the banner of the Virgin and holy relics against siege and pestilence. In other words modern fetichism goes back to this old vague mystic definition of the "self." M. Lévy-Bruhl after citing a long list of ethnographic observations on the image-self, dismisses the notion that it is a result of puerile confidence in analogy, or of mental weakness and confusion, or of a naïve generalization from some animistic hypothesis. To the contrary, it is the result of *really perceiving* the object (*i. e.*, the self) in terms different from ours.[21] De Groot finds the basis for such association of images with beings in suggestive shapes, analogous forms. "An image, especially if pictorial or sculptured, and thus approaching close to the reality, is an *alter ego* of the living reality, an abode of its soul, nay it is that reality itself."[22] From Catlin's observations we gather that at least part of the ascription of life to a portrait is re-

[19] *Op. cit.*, 71.
[20] North American Indians, i, 107-8.
[21] "*Si les primitifs perçoivent l 'image autrement que nous, c'est parce qu'ils perçoivent aussi autrement le modèle.*" (Les fonctions mentales, etc., 44.)
[22] Rel. Syst. of China, iv, 340.

ferable to the optical illusion of its moving eyes. Hence the image-self is a real experience and not mere juggling with or "fudging" experience. It is warm and intimate reality, not wilful nor fantastic self-delusion.

In taking up the soul as part of the self we enter debatable land. I do not believe it is necessary for our purposes to plough extensively over this ground, except to remark that primitive men have no uniform concept of the soul. Its size, shape, number, functions and destiny vary from tribe to tribe. The origin of the concept of soul is likewise probably far from uniform. I have long questioned the all-sufficiency of the pathological swoon-and-dream theory. Nor has M. Durkheim's caustic critique of the Spencer-Tylor animism strengthened my faith in the older theory. Yet I have no substitute to propose except by way of suggesting that sufficient attention has not been given to certain normal psychologic processes from which the idea of a soul might easily have arisen. The common phenomenon of *auditory type of perception* and the inner voice that accompanies conscious thinking would seem to furnish materials readiest to hand for constructing the concept of a little man inside of us, of a guardian spirit, of a 'double,' of a 'soul.' When I (say in the character of an Australian black-fellow or Caroline Islander) think and hear the words of my thought ringing inside my brain-pan, what more natural than to conclude that this still small voice is a mystic somebody at once me and still different from my hands, my shadow, my property, and other parts of my "me?" This conjecture is at least plausible and has the merit of not attempting to derive the normal from the pathological. I should, however, by no means reject pathology as one probable factor in the evolution of the idea of the soul-self. Ribot cites a case from Dr. Leuret which shows how the notion of multiple souls might have arisen. A man convalescing from a fever "believed he consisted of two individuals, of which one was in bed, while the other walked about. Although without appetite, he ate a great deal, having, as he said, two bodies to feed." [23]

Yet such discrimination could only occur where self-consciousness had attained considerable development. Hence we should not expect it from low grade peoples. The same might be said of the dream-self. I should offer the suggestion that instead of the notion of the 'double' originating in dreams, the dream-double would never have crossed the threshold of the savage's attention and interest until the concept of the

[23] The Diseases of Personality, 34-5.

double had already become pretty clearly defined. Furthermore, we must avoid allotting any special significance to primitive dream-life. For, as we have already seen, the savage makes no distinction between dream and waking life; both coalesce and both are equally valid.

But whatever the origin of the concept of soul, there is no questioning the identification of the soul or the dream-double as real parts of the self. The familiar reference of sickness or disease to mishaps suffered by the soul clearly indicates this identification. Some one steals my soul; I sicken; the medicine man hunts out the thief, recovers it and restores it to my "me;" this re-integration of my "self" heals me. My dream double goes wandering off o'nights and loses its way back; I sicken from the subtraction; the medicine man once more goes hunting and finds the errant part of my "me;" once more I am restored.[24] The important point here is the vital unity of the self even when it has been differentiated into a multiplicity of parts.

One of the most fascinating developments of the savage sense of personality is the identification of property as part of the self. A number of interesting problems cluster about the primitive attitude toward property. Is there such a thing as a sense-of-property? Why was the property of the dead destroyed or alienated? How does the distinction between real and personal property originate? If property is identified with self how shall we account for that state of economic communism which is well-nigh universal in rudimentary societies, and what does it argue about the concept of self? Our discussion must be limited to only a summary treatment of these problems.

In the first place, man as an object of natural history has incontestably an instinct for property; yet in the same sense that the amoeba has an instinct for property, and only in that sense. This instinct is simply the expression of the more general and fundamental will-to-live. But if we observe man as a member of human society the matter is by no means so clear; property here seems not to be rooted in mere love of possession. For we find the instinct modified, contravened, and even obliterated by other instincts and motives. What seems to be man's 'instinct for ownership' may frequently

[24] Many Old Testament references to the soul, quite apart from any mere verbal suggestion, appear to be pretty nearly upon this plane of thought. "He *restoreth* my soul," (Ps. 23); "The liberal soul shall be made *fat*," (Prov. 11.); etc. And later theology involving destruction of both soul and body sounds curiously like primitive beliefs about the "second death" of a material substance.

turn out to be in reality love of activity or of mastery. And the reason lies in just this fact, that he is member of a group, and that his self, which extends itself more or less consciously to property, takes on the color of his group surroundings and is modified by them.[25] Man in society is never fundamentally and inalterably egoistic, but is at once self and other-self, ego and alter, inextricably blended and interwoven. To forget this is to fall into a maze of fallacies surrounding the ancient problem of the relation of individual to society. The moment man attains *self*-consciousness he has emerged from natural history with its brute struggle for self-maintenance and its crass sense of property, and has become the center of those psychic and social forces which really create him *man*. "As a herd of individuals mankind would have a natural history as other animals have; but personality can only emerge out of intercourse with persons."[26] This intercourse with persons gives him in the most absolute sense his "me," including its expression in property and every other form. It is quite natural that with the attainment of consciousness of self, man should seek to enlarge his self-concept, to define it, in other words, to develop his individuality. But this does not necessarily mean to aggrandize his self at the expense of other selves in the group. The constant check upon any such impulse to aggrandize is furnished by the group consciousness of its unity. Consequently the individual self is subordinated to the interests of the group and takes its key and coloring from it. This is of course the secret of the tremendous power of the mores, traditions, folkways, and all that group of more or less unformulated means for social control, to say nothing of more highly developed institutions for control. It would seem then that the original biologic sense of property in its individualistic aspect may become and does become something quite different when the sense of self-as-a-social-being emerges. It is not necessary to state dogmatically that the more primitive a group, the more communistic it is, nor that communism in property was ever absolute and un-

[25] Take, for example, the matter of property in shelter. According to Fewkes (*Smithsonian Report*, 1910, p. 614), what led man originally to seek caves for habitation was "a desire for shelter from the elements, but not so much protection for himself as for others—for his offspring. . . . Their use for habitation was secondary, the primary motive being mainly altruistic, the same as that which leads the insect, bird, and mammal to make their nests." It is interesting to note that caves were likewise used for other distinctively *social* and *communal* purposes: burial, storing sacred paraphernalia, performance of sacred rites, etc.

[26] James Ward, *Encycl. Brit.*, 9th ed., vol. xx, p. 75, note.

compromising. It is sufficient to find communism in land, mines, food, etc., in every quarter of the globe to conclude that such men manifest an undeveloped non-militant sense of personality in property.[27] It goes to show that property as we have come to consider it is either an acquired characteristic (and as such modifiable), or a reversion to the crude sub-human instinct for self-maintenance at any cost.

On the other hand, since men are marked off from each other and do not coalesce in a gelatinoid mass, it is perfectly natural and altogether in keeping with group interests that their selves should tend to expression in purely *personal* property. Hence we find even in communistic groups private property in clothes, ornaments, trinkets or tools; and taboos to preserve their individual ownership. Thus the taboo is frequently the outward visible sign of the participation of such property in the owner's personality; hence its sacredness; hence its inviolability. This, too, probably explains at least in part the wide-spread custom of destroying the property of the dead. Such a principle eliminates many of the fantastic interpretations of the custom, which really explain nothing, and themselves require interpretation upon interpretation. Such, for example, the notion that a man's horse or house or widow or slave must be destroyed because of the dead person's covetousness or jealousy;[28] or that by smashing or burning a man's pottery, bows, spears, etc., their "souls" are released and enabled to accompany their late owner. These reasons may be given by savages who have forgotten the original significance of the custom. The more fundamental notion seems to be that property of the dead is not destroyed to *benefit him,* but *because it is he himself,* literally and absolutely. M. Lévy-Bruhl[29] applies the same reasoning to the taboos on widows between the 'first' and 'second' deaths of their spouses, though I confess that the principle of ghost avoidance may be in this instance nearer the truth. The

[27] "If the savage is incapable of conceiving the idea of individual possession of objects not incorporated with his person, it is because he has no conception of his individuality as distinct from the consanguine group in which he lives." (Lafargue, Evolution of Property, 18.) Cf. T. E. C. Leslie's introduction to Laveleye's Primitive Property, pp. xi-xii: "Property in the infancy of social progress consisted, one may say, simply in the feeling of unity and consequently co-ownership on the part of the men of a tribe, horde, clan, sect, or family."

[28] This does not deny that taboos and destruction of property of the dead are part of the general cult of avoidance and propitiation of ghosts and daemons.

[29] Les fonctions mentales, etc., 378 ff.

finesse displayed by modern Kafirs brings this identification of the dead man's property with his self into clear relief, and seems to justify our interpretation of mortuary destruction of property.

"If a Kafir should buy a blanket and coat and never use it before he died, then it would not be buried with him but would be passed on to the heir; if the man had worn it but once, and had soiled it with a little perspiration, then it would be buried with him. In this latter case it contains a part of his dirt and therefore a part of his personality. So with an assegai; the only part of the weapon that has the man's dirt ingrained into it is the wooden handle; this therefore contains a part of the man's personality and must be buried with him; but the iron point does not come into contact with the man, and so contains no part of the man's personality; therefore it needs but a ceremonial washing to make it the property of the heir."[30]

Such a concept of the dirt-property-self marches along with and is perhaps a variant of the notion of the feces as part of the personality. Its connection with exuvial customs (preserving parings of nails, clippings of hair, etc.) is even more striking. The exuvial-self explains many exuvial sacrifices and exuvial fetiches.

We have already hinted several times in passing that the individual's sense of his own personal self is frequently subordinated to a mystical sense of the group personality, the larger self. We shall now see more precisely how this group sense acts upon the individual's definition of his self. To treat the matter thoroughly would require an elaborate review of the whole subject of primitive methods of reckoning kinship and relationship. We must confine ourselves, however, to bare indications of how these matters were conceived and felt. Primitive kinship, so it appears, rests originally on common work, common ownership, common food: in other words, on participation in common group activities and supplies. Blood relationship as we know it is certainly a derivative from this earlier (to us), conventional method of reckoning kinship. Two lines of proof exist: first, the reckoning of relationship outside the bounds of consanguinity; second, the ignorance of the process of human reproduction still to be found among certain tribes. Such institutions as the couvade and adoption are fictive devices indicating a transition period between an earlier vague definition of kinship and a more precise physiological concept of relationship.[31] The general historic sequence of ideas concerning relationship is, first, that a child is related to his group, next to his mother and her kin but

[30] Kidd, Savage Childhood, 67.

[31] For a detailed exposition of these points see the writer's Primitive Family as an Educational Agency, chap. iv.

not to his father, next to his father and his kin but not to his mother, and finally to both father and mother.[32]

All these variations in the definition of kinship are at the same time variations in the concept of personality. We are interested particularly in that concept of kinship and of personality by which the individual is subordinated to his family or larger social group. It is immaterial to our purpose whether such a concept involves group-marriage or not. Nor are we required to accept such a literal view of 'collective parenthood' as Professor Kohler sets forth.[33] Yet we must not be too hasty in rejecting such ideas as fantastic, for the human mind is infinitely credulous. Take, for example, the Kafir's notion of his group-self. "A Kafir feels that the 'frame that binds him in' extends to the clan. The sense of solidarity of the family in Europe is thin and feeble compared to the full-blooded sense of corporate union of the Kafir clan. The claims of the clan entirely swamp the rights of the individual. . . . The striking thing about this unity of the clan is that it was not a *thought-out* plan imposed from without by legislation upon an unwilling people, but it was a *felt-out* plan which arose spontaneously along the line of least resistance. If one member of the clan suffered all the members suffered, not in sentimental phraseology, but in real fact."[34] This intimate sense of group solidarity becomes translated into terms of individual personality; so we find that every true Kafir has two personalities: his *idhlozi* or individual, personal, inalienable spirit; and his *itongo* or ancestral spirit, which is not personal but tribal, and comes not by birth but by initiatory rites. To be without this clan or tribal spirit is the greatest calamity a Kafir can conceive. Such a man goes through life 'unprotected;' that is, his ancestral guardian angel is lacking, his self is dwarfed and truncated. In British Nigeria we are told that the individual

[32] This is a modified expression of Lubbock's much debated dictum, in his Origin of Civilization, 3d ed. p. 149; repeated in Marriage, Totemism and Religion (1911), p. 52.

[33] Kohler in defending Morgan's theory of group marriage deduces the common occurrence of group kinship from primeval collectivity of women. Hence for the primitive man the group of women whom he calls 'mothers' form a real individual, a single personality endowed with a plurality of genital organs. Hence it is not surprising that he considered himself peculiarly related to this multiple personality. All of which would mean also that every child is *ours* to the collective-mother. (*Zts. f. Rechtswissenschaft*, xix, 171-188, 423-432; xxi, 252-267.

[34] Kidd, Savage Childhood, 15.

" is sunk in the family, village, or tribe." [35] Of our American Indians Bandelier says: "It may be said of the red man that he keeps secrets in the same manner that he lives,—namely in groups or clusters. The reason is that with him individualism, or the mental and moral independence of the individual, has not attained the high degree of development which prevails among white races." [36]

The reasons for such subordination of the individual in both his actions and his thought of himself are to be found in the exigencies of self-maintenance and self-perpetuation, which for their successful issue have developed a closely woven fabric of community life. These conditions together with the ignorance and inexperience of primitive mind gave rise to that vague and unformulated philosophy of the self and men and things which might easily be called secular mysticism.[37] It is interesting to note that when this vague mysticism becomes differentiated into Sacred and Secular, the Here and the Beyond, and gods arise, these gods are at first *group* gods, not personal gods. The primitive Semites, for example, conceived their gods as caring only for the tribe and not for the individual.[38]

Such group solidarity appears all the more strikingly in primitive notions of sin and its punishment. We must remem-

[35] Mockler-Ferryman, British Nigeria, 230.

[36] The Delight Makers, 13. Mr. E. J. Payne in his profound study of American aboriginal language discovered that the collective or we-form is the more common and the selective or I-form exceptional. "No more interesting illustration could be adduced of the sense of solidarity naturally pervading the food-group, and of the natural sense of weakness in its members individually." (Hist. of America, ii, 188.)

[37] "The primitive man can hardly have been definitely conscious of values which were not supported and shared by the group of which he was a part. A direct result of such a condition would be a vague, indefinite sense of his own personality. The group itself will not be analyzed, but will be conceived in the gross, as the universe in which he moves and has his being, as, in fact, identical with *himself*." King, Development of Religion, 66. This predominance of the group and group-feelings due to primitive notions of 'participation,' seems to be what James had in mind when he wrote (Prin. of Psychology, ii, 368, note), "In general it is probable that the consciousness of how we stand with other people occupies a relatively larger part of the mind, the lower one goes in the scale of culture."

[38] W. R. Smith, Religion of the Semites. New ed. (1901), pp. 258 ff. This seems to be the religious expression of 'pessimistic evolutionism'; recall, for example, Tennyson's *In Memoriam*, lv:

> "Are God and Nature then at strife,
> That Nature lends such evil dreams?
> So careful of the type she seems,
> So careless of the single life."

ber that primitive sin was wholly an objective or ritualistic breach, and not a sense of ethical shortcoming. Precisely because it was objective and because of the close-knit life of the group in other respects, the sense of sin became, too, a group-sense. Hence the breach of any member of the group involved the whole. Ten righteous men might have saved Sodom, but the un-rightness of one would have sufficed to bring down its destruction. This sense of group responsibility is the source of a tremendous sanction for discipline and right conduct. It gives to taboos their inviolability.

The story of a three years' famine in Israel during the reign of David illustrates these points. (ii Samuel, ch. xxi.) Saul had slain certain Gibeonites contrary to treaty. Years afterward the famine ravaged. David enquired of the Lord. The Lord explained the affliction of the nation as resulting from "Saul and his bloody house, because he slew the Gibeonites." The Gibeonites demanded blood-revenge—the hanging of Saul's seven sons. This was granted, and the seven were hanged "in the hill before the Lord." Evidently this wiping out of seven guilty individuals squared the accounts of the whole group and pleased the tribal god, for we are left with the impression that all went well afterwards and that the famine was raised. Similarly, violation of a taboo by an Eskimo brings punishment upon the whole group. An Eskimo hunter must avoid contact with corpses or bleeding persons. For the souls of sea animals are quick to detect these contaminations and evade the hunters. If a hunter has had the ill luck to do either of these things he must at once avow it. "If he does not do so he will bring ill luck to all the hunters. . . . The transgressor of a custom is distasteful to Sedna and to the animals, and those who abide with him will become equally distasteful through contact with him. For this reason it has come to be an act required by custom and morals to confess any and every transgression of a taboo, in order to protect the community from the evil influences of contact with the evil-doer. The descriptions of Eskimo life given by many observers contain records of starvation which, according to the belief of the natives, was brought about by some one transgressing a law and not announcing what he had done."[39] Death, according to Thonga belief, is both cause and result of group contamination; and a village in which it occurs cannot come back to the ordinary course of life without a special collective purification.[40] The Colonial Puritans had this group sense of sin highly developed. In the early 18th century we find Judge Sewall, one of the witch-baiters, making his confession of penitence for his judicial acts in that unhallowed business; he asks for the prayers of the brethren that God may "not visit the sin of him or of any other, upon himself, or any of his, nor upon the land."[41]

This subordination of the individual's sense of self to that of the group is still further illustrated by certain primitive

[39] Boas, *Pop. Sci. Monthly*, 57: 627; cf. in general, Lippert, Kulturgeschichte, ii, 497; F. Justi, Geschichte des alten Persiens, 199.
[40] Junod, The Life of a South African Tribe, vol. i, p. 152.
[41] Weeden, Economic and Social History of New England, i, 421-2.

beliefs regarding reincarnation, family-totems, etc. The Egyptian Book of the Dead speaks of a period "when Horus came to light *in his children.*"[42] A Maidu legend (California) tells of the miraculous birth of Oan-koi-tu-peh, whose sire was the Red Cloud. The Red Cloud told the young mother: "Whenever you see him think of me. This boy has no life apart from me; he is myself."[43] An Irish manuscript of the 11th century relates a similar notion regarding the great hero Cuchulainn. The men of Ulster took counsel about him, fearing his early death; they "wished to give him a wife that he might leave an heir, *for they knew that his re-birth would be of himself.*"[44] The laws of Manu express the same belief: "The husband, after conception by his wife, becomes an embryo and is born again of her."[45] A corresponding Hindu ritual required the father to address a new-born babe thus: "From limb by limb thou art produced; out of the heart thou art born; thou indeed art the self (âtman) called son."[46] Among the Aruntas of Australia every individual is a direct reincarnation of an ancestor of the mythical alcheringa period or of some totemic animal of that period.[47] I have reserved as a final illustration of the identification of the individual with his family some remarkable cases from northern China. Mr. Johnston, who relates these incidents, encountered them as actual problems in the course of his daily affairs as a judge in China:

"The Weihaiwei farmer has indeed so limited a conception of his own existence as a separate and distinct personality that in ordinary speech he continually confuses himself with his ancestors or with living members of his family. Examples of this are of repeated occurrence in the law-courts. "I bought this land and now the Tung family is trying to steal it from me," complains a petitioner. "When did you buy it?" asks the magistrate. "Two hundred years ago," promptly replies the oppressed one. Says another, "My rights to the property of Sung Lien-têng are being contested by my distant cousin. I am the rightful owner. I buried Sung Lien-têng and have charge of his soul-tablet and carry out the ancestral ceremonies." "When

[42] Book of the Dead, c. 112, transl. Renouf, in *Proc. Soc. Bibl. Arch.*, xvii, 8; Budge's translation of this chapter renders the idea thus: "Then the company of the gods, who were among the divine followers of Horus when he existed in the form of his own child, etc. . . .

[43] S. Powers, Tribes of California, *Contrib. to N. A. Ethnology*, iii, 299.

[44] Kuno Meyer, *Archeol. Rev.* i, 70.

[45] Sacred Books of the East, xxv, 329; xii, 334. An echo of this oriental belief perhaps occurs in Nicodemus' question about rebirth.

[46] Sacred B. of the E. xxx, 211; cf. a passage in the Brihadâranyaka-Upanishad (Sacr. Books, xv, 96).

[47] Spencer & Gillen, *N. T. C. A.*, 202-4, 169-70.

did Sung Lien-têng die?" questions the magistrate. "In the fortieth year of K'ang Hsi," is the reply. This means that the deceased whose property is in dispute died childless in 1701, that plaintiff's ancestor in that year defrayed the funeral expenses and acted as chief mourner, that by family agreement he was installed as adopted son to the deceased and heir to his property, and that plaintiff claims to be the adopted son's descendant and heir. Looking upon his family, dead and alive, as one and indivisible, he could not see any practical difference between the statement that certain funeral rites had been carried out by himself and the statement that they had been carried out by a direct ancestor. . . Another litigant, whose long residence abroad had had no apparent effect on his general outlook on life, came to me very recently with the complaint that on his return from Manchuria he had found his land in the possession of a neighbor. "I went to Manchuria as my family had not enough to eat," he said. "I came home this year and wished to redeem the land I had mortgaged before I went away. But I found it had already been redeemed by my neighbor, a cousin, and he refuses to let me redeem it from him." On being asked when he had mortgaged his land and emigrated, he replied: "In Chia Ch'ing 3"—that is, in 1798. He was merely identifying himself with his own great-grandfather. . . . In another case a man whom I will call A brought a plaint to the effect that he wished to adopt B, and that C for various reasons refused to allow this adoption to take place. On investigation it turns out that B is dead and that it is his infant son D whom A really wishes to adopt. B and D—father and son—seem to A merely different expressions, as it were, of the same entity. This does not mean, of course, that supposing B were still alive it would not matter whether B or D actually became A's adopted son. The rules of adoption in China are strictly regulated. A man cannot adopt any one he likes. Not to mention other necessary conditions, the person adopted must belong to the appropriate generation, that is, to the gneration immediately junior to that of the adopter. In the case before us the infant D belonged to the proper generation, and his father B could not have been adopted. To our notions it seems all the stranger that A, knowing this, should have spoken of B when he meant D; yet this manner of speech is exceedingly common." The writer then goes on to show further evidence that the individual is not regarded as an independent unit, citing the restrictions placed on the powers of the individual to dispose of real property.[48]

At this point it may be of interest to note that mere birth does not always confer personality upon the infant. Frequently it must be achieved through rites and ceremonies. Thus among the Bayaka a boy has no personality distinct from his father's until circumcision.[49] In British Central

[48] R. F. Johnston, Lion and Dragon in Northern China, 139-41. Added light is shed upon such phenomena by Mr. Tao's explanation of ancestor worship. It did not originate, he claims, "from the dread of ghosts, nor is it an 'animistic lottery' for securing material welfare or advantage. Ancestor worship is rather the expression of an instinctive craving to trace the origin of the self." *Sociological Review*, vi, 51.

[49] Torday and Joyce, xxxvi *JAI*, 42.

Africa a new-born infant is not regarded as an individual, as a person, until it receives at least a portion of its mother's personality in the shape of nourishment.[50] Among the Giliaks of Saghalin Island new-born children for some time are not differentiated into 'boys' and 'girls.'[51] Among the Zuñi Indians Cushing tells us that "when a Zuñi woman is about to give birth she is, if possible, retired into a room of "sacred enclosure." The entrance and windows of this room are carefully screened with blankets, and over or on the entrance way, whether door or sky hole, a plume of warning, or taboo, is attached so that none but the appointed may enter. Here the child must remain until the morning of the tenth day after birth. For as yet it is not born into the world of men. Nine days, representing the months of its gestation, are required for its formation and "hardening" as a human being, against all malign influences. For it is supposed by them that during the period of this formation, the child is, as were all beings of creation when the world was new, *kyai-u-na*—unripe and susceptible, impressionable even as are the grains of growing corn when in milk" . . .[52] Many other curious birth customs probably owe their origin to similar beliefs. Collateral evidence of the child's supposed lack of personality may be deduced from primitive infanticide, child sacrifice, and child cannibalism. Another line of evidence is suggested from West Africa, where death is usually considered to result from sorcery and where sorcerers are hunted out and killed: it is significant that no such pursuits follow the death of a child, a slave, or a person of no consequence.[53]

III. We have seen how according to primitive philosophy a man acquires his self, and how he may lose part or all of it. Now we must turn to observe how he can change it. In brief, we shall examine the doctrine of metamorphosis in its relation to the concept of self. This will necessitate a momentary return to the savage's general philosophy of nature. We suggested a while ago that this philosophy was altogether too vague to be termed definitely animistic, and suggested mysticism, dynamism, etc. The truth is that to the primitive mind the world and its events were fluid, changeable, capricious, not to be caught and held in fixed and hard categories.

[50] Werner, British Central Africa, 103.
[51] Piludski, *Anthropos*, v, 756-74.
[52] Primitive Motherhood, 30-1. (In *Proc. 1st Cong. of Mothers*, Washington, 1897.)
[53] Levy-Bruhl, *op. cit.*, 325, after Nassau.

The only universal laws were, first, that all is possible; second, that all is related; third, that all changes.

The first 'law' is too obvious to require illustration. The second, the law of relation, or participation (mystic symbiosis, as M. Lévy-Bruhl puts it), is not a definitely reasoned pantheism, but a vague emotional feeling of community, based upon a failure to mark off the various kingdoms and forces of nature.[54] Here fusion and identity, and not difference or separation are significant. Men and all other things swim in a sort of 'imponderable ether, that fills all space, rigid as adamant, but infinitely elastic,' etc. Such a vague comprehensive concept gives the basis for and expresses itself in various forms of magic, divination and religion: such as fertility rites, food-increase dances, magical communication of powers and qualities by contact. In terms of personality the concept finds its expression as the human self in direct contact with mysterious impersonal force, permeated by it, communicating it. Hence we get the notion of a person as 'mana,' 'orenda,' 'wakanda' or 'manito;' that is, as emanating or manifesting a peculiar quality or power. Thus chiefs, strong men, certain plants, animals, inanimate objects or natural forces are said to have *mana*. This must not be confused with 'possession' by familiar spirits or geniuses. It is rather a manifestation of vague pervasive vital force. The words denoting it are used sometimes as adjectives, sometimes as substantives, and may be rendered as power, strength, mystic, terrible, sacred, secret, remarkable.[55] It is all of these and more. Like many other primitive concepts this almost baffles attempts to translate it into modern logical thought or speech. But this much is certain: it denotes a vital pervasive compelling force in primitive thought. And the phenomenon is so widespread that one is almost justified in pronouncing it a universal stage in the evolution of human thought, a stage anterior even to the soul or double. Observers have noted it throughout Indian America, in Melanesia,

[54] For example, the Yakuts think fire is a *fussy old man*, always whispering and shuffling—a personality to be coddled. Recall that as late as the 13th century Pope Calixtus excommunicated a comet; and that frequently in the middle ages grasshoppers and other animals were gravely interdicted in courts of justice!

[55] "The idea seems adequately expressed by our term 'wonderful.'" (Boas, article 'Religion' in *Handbook of American Indians.*) But Hewitt says: "Those who interpret these terms as denotive simply of what is expressed by the English words 'mystery,' 'immortal,' 'magic,' 'sorcery,' or 'wonderful,' fail to appreciate the true nature and functions of the assumed power denoted by these terms as conceived by the Indians." (*Handbook of Amer. Ind.*, article 'orenda.')

among the Maori, in Africa.[56] The Fêng-Shui of the Chinese and the Virtue of classic antiquity and primitive Christianity are survivals of the same thought.[57] This is not exactly fetichism in the modern sense of fetich as the dwelling place of a definite spirit, but it is no doubt the broad base from which fetichism sprang. It is also the very stuff and methodology of magic, and, as Halliday suggests, for the very reason that personality is so widely and vaguely conceived. The magician works by his *mana* or *orenda,* that is, by 'contagion of qualities'; union or contact with power becomes in this way the foundation of both magic and religion; for "the wide area of personality as it is conceived in the lower culture, enables persons quite easily to be united or brought into contact with power."[58] Frazer's great collection of facts clustering about the tree-spirit, the king-priest-god-'vegetation-spirit,' who is killed annually, illustrates how this primal notion of the sensitive community between men, animals and cosmic powers animated both oriental and classical religion and myth.[59] It may also be said to survive in Christian ritual and tradition. The 'pathetic fallacy' of forcing Nature's moods into accord with those of suffering gods and heroes is as old as literature and still remains a trump card for the melodramatist or the romantic novelist.

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[56] See, e. g. Dorsey, *11th Bur. Ethnol.,* 494, 467, 432-3, 365; McGee, *15th Bur. Ethnol.,* 182; Miss Fletcher, xxvii, *JAI.,* 437; *id. Proc. Amer. Soc. Adv. Sci.,* 1897, 326; Spencer & Gillen, *N. T. C. A.,* 548, note; *id.* Northern Tribes, 629; Holles, The Masai, xix; Codrington, Melanesians, 118-9; Cambridge Exp. to Torres Straits, vi, 244-5; Hubert & Mauss, *L'Année Sociologique,* vii, 101 ff, 108 ff, 118, etc.; Hartland, *Man,* Mar. 12, 1912, p. 45; Lovejoy, *Monist,* xvi, 357-82; Hetherwick, xxxii, *JAI.,* 93-5; Jones, 'The Algonkin Manitou,' *Jour. Amer. Folk-Lore,* 1905, 183-91.

[57] For example, 'Virtue had gone out of him,' (Mark, v, 30; Luke, vi, 19, viii, 46, etc.); cf. also the Virtue in relics of saints and heroes. The visitor to the church of St. Etienne du Mont in Paris during the feast of Ste. Genevieve will see hundreds of persons still practising the doctrine of *mana* at the saint's shrine. A handkerchief or rosary becomes magnetized, as it were, by exposure to the saint's body or by touching her tomb.

[58] *Folk-lore,* xx, 147-67.

[59] Dr. K. Th. Preuss at the International Cong. for History of Religions at Leiden 1912, supported with great force this primitive notion of a 'magical unity.' The nearest relations as members of a group, he thinks, were regarded as a magic unity, corresponding to the tendency to regard groups of external objects such as the starry heavens, clouds, various forms of fire, an animal or plant species as a magic unity—of which at the same time each specimen represents that unity. In the light of what we know now of magic this seems clear enough. But we fail to see quite so clearly as Dr. Preuss seems to, how exogamy is derived from it by a natural process.

The third primitive law or principle, viz., that all changes, is simply a corollary to the one we have just considered. For if all is fused and undifferentiated in nature and there are no metes or bounds to the powers of men, animals, stones, and other members of this cosmic democracy, then it requires no stretching of the mind to conceive stock doing duty as stone, man becoming animal, or animal and stone giving birth to man. All barriers are down and the self so fluid that *this* can become *that* and *the other* at will. Abundant evidence is at hand to prove that this view of primitive sense of self is not fantastic nor exaggerated. We have already said that savage mind is rather zoomorphic than anthropomorphic. This is clearly brought out by von den Steinen:

"To understand the way of thinking of the Indians we must throw aside entirely our notions of the division between man and other animals. A medicine man understands all the languages of beasts, birds and fishes. They have no notion of any ethical humanity. Being good and bad is only doing pleasant or unpleasant things to others. Abstract notions of good and ill, uncontrolled by fear or reward are wanting. The animals differ only in having no tools. Hence men arise from arrows and women from maize pestles. The Indian does not say "I am a man, and I think of the animals as acting like men." On the contrary men are thought of as animals, both in the good and bad sense. The tribes identify themselves and each other with animals. Some animals are also thought of as being the lord of particular plants, such as tobacco, cotton, mandioca, and other animals as lords of sleep or of the hammock, or of the jars filled with water. In fact, the Indian received the most important parts of his civilization from those persons whom he called animals. He owes to them the teeth, bones, claws, shells which he uses as tools and weapons. He is indebted for what he can do to the animals, his neighbors. Why should he not attribute to them the other things whose origin he does not know? The animals have not got those to-day because man has taken them away."[60]

The Tarahumares of Mexico, according to Lumholtz, feel that the animals are in no wise inferior to man, that they understand magic, know many things and can aid the Tarahumares in making rain. Similarly it is stated that a Bushman questioned by a missionary "could not state any difference between a man and a brute—he did not know but a buffalo might shoot with bows and arrows as well as a man, if it had them." "When the Russians first landed on one of the Alaskan Islands the people took them for cuttle fish 'on account of the buttons on their clothes.'"[61] "Some of

[60] Shingu Tribes (Berlin Museum, 1888), p. 351.

[61] Frazer, Golden Bough, ii, 108, note. Cf. Lubbock, Marriage, Totemism & Religion, 108-9, for sense of brotherhood between Peruvians and certain fish; also Hose & Macdougall, xxxi, *JAI*, for relations between men and animals in Sarawak. This zoomorphic

the Ainos believe themselves to be descended from a bear and call themselves after it." [62] Among the Aruntas in a certain totemic ceremony an individual figures apparently indiscriminately as the rat-man or man-rat.[63] The Trumai of Northern Brazil say that they *are* aquatic animals. The Bororo boast that they *are* red paroquets. This does not mean merely that after death they will be transformed into paroquets, nor that paroquets are Bororos metamorphosed. Steinen says expressly (even though he refused at first to believe it), "the Bororos give it out coolly that they *are actually* paroquets (arras) exactly as if a caterpillar should say it is a butterfly." [64] It is not a name they adopt, nor is it a fancied relationship; it is an essential identity. And the same mental process no doubt holds in most totemic systems. This identification of primitive men with stocks and stones, with their totemic plants and animals, must not be thought of, however, in physiologic or structural terms, but rather in spiritual terms; that is, spiritual in the primal vague, loose sense. The identification consists in the fact that both are emanations or manifestations of a common energy or spirit behind all things. It is indeed a sort of pantheistic communism. This explains why, for example, the Bororos can actually think themselves paroquets even while they have no feathers and cannot fly.[65] It further explains the fact that such 'community' between men and animals does not stop there but may be extended to directions, localities and qualities; for example, to points of the compass, seasons, winds, colors. Hence probably the significance of orientation of graves, buildings, prayers; though such customs may also result from ancestor worship or the grave-cult. Hence, too, such 'sympathies' as the Baganda believe exist between a barren wife and the soil. A sterile Baganda woman may be repudiated because her sterility communicates itself also to her husband's garden.[66] Similarly in

tendency still lingers in modern thieves' slang. For example leather = skin; mufle or snout = face; bec or beak = mouth; wing = arm; flipper = hand. For a curious confirmation of zoomorphism from prehistoric archeology see Luquet, *L'Anthropologie*, xxi, 409-23.

[62] Lubbock, *op. cit.*, 109, citing Rev. J. Batchelor.

[63] Spencer and Gillen, *N. T. C. A.*, 231.

[64] Unter den Naturvölkern Zentral-Brasiliens, 305-6.

[65] Cf. Lévy-Bruhl, *op. cit.*, 100 ff; Hartland, Primitive Paternity, i, 191, 250. Jones in the article already referred to says that the Algonkins conceive of *manitou* as an objective presence, with the quality of self-dependence, without form or feature, "The most common experience seems to be that of being overwhelmed by an all-encompassing presence."

[66] Roscoe, xxxii, *JAI.*, 38, 56.

Japan only a young man is allowed to graft trees "because the graft needs all the vital energy possible." [67] A Welsh poem of the 12th century contained a sentiment to the effect that with false kings come failure of crops, bad years, and long days. Pokorny cites an example from the old Irish "Book of Leinster": under Cairbre Cinnchait who gained his throne by violence and caused the children of the nobles to be put to death without pity, each ear of corn bore only a single grain, each oak only one acorn. But when the old dynasty was restored Ireland regained her wonted fertility.[68] It is quite probable that many royal taboos (as Frazer and others have suggested) arose from this belief in sensitive relationship between man and nature.

To the set of ideas centering around this primitive communism between men and other creatures belongs the widespread custom of tracing tribal or family descent from plants, animals or inanimate objects. As we have already treated this subject elsewhere in considerable detail [69] it will be necessary here to cite only a few illustrations.

Bantu folk tales describe prehistoric times when human and lower animals were supposed to associate in marriage.[70] In the 59th Rune of the Kalevala (the story of the virgin Marietta), it is expressly stated that she conceived by a mountain berry:

> "Marietta, child of beauty,
> Thus became a bride impregnate,
> Wedded to the mountain berry," etc.

Later she gave birth to the child in a 'woodland manger' after a long series of painful adventures. In the same Rune the child is spoken of as follows:

> "Since the child is but an outcast,
> Born and cradled in a manger,
> Since the berry is his father," etc.

In China, a young widow claimed to have had a child *by the clay statue* of her dead husband.[71] The Indians of the Northwest claim descent from certain animals: "Francois is a member of that sept of the StsEelis whose remote ancestor was an otter. So I sought to learn from him whether they looked upon the otter as their relatives and paid regard to these animals by not killing or hunting them. He smiled at the question and shook his head, and later explained that although they believed their remote ancestor to have been an

[67] Chamberlain, Things Japanese, 449.

[68] *Mittheil. d. Anthrop. Ges. in Wien*, xxxviii, 34-45.

[69] Primitive Family as an Educational Agency, ch. iv; here will be found also illustrations of the converse phenomenon, viz., animals springing from human beings.

[70] R. H. Nassau, Where Animals Talk, 165.

[71] De Groot, Relig. Syst. of China, Bk. ii, (vol. iv), 342-5, cites this and other similar cases.

otter they did not think it was the same kind of otter as lived now. The otters from which they were descended were otter-people, not animals, who had the power to change from the form of men and women to those of the otter. All the animals in the old time were like that, they were not just common animals and nothing else; they were people as well, and could take the human or animal form at will by putting on or taking off the skin or other natural clothing of the animal."[72]

Now we come to still more specific examples of how nature's barriers are let down in primitive thought. Under the general term metamorphosis we shall include transformations of things into other things, things into persons, persons into things, persons into other persons.

A curious creation myth of the Mewan Indians illustrates the first phase of metamorphosis. After O-let-te and Wek-wek had created mankind, O-Let-te said to Wek-wek, "Now we also are going to change; I am going to be a hunting animal and you are going to be a hunting bird." . . . So O-Let-te the Coyote,-man, whose form up to this time we do not know, changed to the Coyote, a furry hunting animal. And Wek-wek changed to the Falcon, a hunting bird."[73] Even more striking is a myth from the Huichols of Mexico, according to which the wheat was at one time a deer.[74]

The old Greek legend of Pygmalion may be matched with many instances from modern ethnography to illustrate the second phase. In China statues of men and animals are believed to transmute themselves into real human beings.[75] And a similar belief has been observed among our North American Indians. Lafcadio Hearn recounts a Japanese legend of somewhat like tenor. "Also in those days there appeared in many provinces a Buddhist priest of giant stature, whom none remembered to have seen before and whose name no man knew, traveling through the land, and everywhere exhorting the people to pray before the bell of En-gaku-ji. And it was at last discovered that the giant pilgrim was the holy bell itself, transformed by supernatural power into the form of a priest. And after these things had happened, many prayed before the bell, and obtained their wishes."[76]

C. H. Harper, writing of totemism among certain Gold Coast tribes, says: "I have heard the story of a hunter who killed a deer and part of the body turned into a human being before it expired, but I believe it is a mere legend."[77]

European fairy lore with its tales of frog-princes, raven-princesses and the like furnishes parallel instances. In old German folklore the stork and human beings were commonly interchangeable by metamorphosis. New England witch-baiters were equally credulous. In the trial of the Indian woman Titiba, accused of witchcraft, it trans-

[72] C. Hill Tout, xxxiv, *JAI.*, 335-6. This citation is particularly valuable because of Mr. Tout's qualifications and scrupulous care as an ethnographer.

[73] Merriam, The Dawn of the World, 87.

[74] Lumholtz, Unknown Mexico, ii, 45.

[75] De Groot, *op. cit.*, ii, 340-55.

[76] Glimpses of Unfamiliar Japan, i, 68.

[77] xxxvi, *JAI.*, 186.

pired that the devil appeared now as a tall man of Boston, now as a hog, now a great dog, a black dog, a man who threatened to hurt her; also apparently on occasions as a black or red rat. So far as the records show she was believed by her judges! The Egyptian belief that Ginnees (daemons) assume animal forms, notably cats and dogs, is another variant of this general belief. Ezekiel's vision of the valley of dry bones which became living men is perhaps an echo of it; and the dogma of literal transubstantiation as held by certain portions of Christendom is certainly a survival of it. Perhaps here should be reckoned also such crude 'miracles' as the liquefaction of St. Januarius' blood.

The myths of Proteus, of Apollo and Daphne, the legend of Circe and her pigs,[78] and the well-nigh universal belief in were-wolves typify the metamorphosis of persons into things. Lot's wife is a familiar case in point. A curious variant of the Protean legend occurs in the folklore of the Golds (eastern Siberia). Fuji changes herself into a needle, a worm, a drop of blood, a gadfly, a skunk, and so on almost *ad infinitum*.[79] Puck in Midsummer Night's Dream is one of the same brood. Shakespeare's catalogue of his threatened metamorphoses reads like a chapter in folklore. Ellis states that among the Yorubas, "a belief in metamorphosis is universal, and is not limited to a change to an animal form, since men and women are sometimes transformed into trees, shrubs, rocks, or natural features. The shrub *bujo*, whose fruit is used to stain the skin in imitation of tattoo marks, was a Yoruba belle of that name, who was metamorphosed. . . . The Iyewa lagoon is also said to have been a woman."[80]

Lane reports an Egyptian belief in the metamorphosis of alum into human form, which is used as a charm against the evil eye.[81] Amongst the ancient Scandinavian peoples the most powerful form of magic was the ceremony of the *Seid:* in the course of it a woman could sometimes, while lying on a platform in the center of the group, change herself into another shape, often that of an animal, go to other cities and see what was happening there. If she were injured or killed during this period her body showed the marks.[82] The Kafir, says Mr. Kidd, "makes many strange but picturesque mistakes in localizing the 'self' . . . he is at such an elementary stage of thought that he imagines he can by magical charms, change himself into a wild animal and devour human beings, and then by magic transform himself back again into his original human shape."[83] The Malays have a tale of how a noted magician (a fishing-wizard) dived into the sea and became the porpoise; also of a child who fell into the river and became a crocodile.[84] Among the Serbs, at least until recently, it was commonly believed that people could be transformed into trees and plants, and conversely that human souls might be extracted from plants.

We are not concerned with the origins of the belief in wer-beasts,

[78] Cf. the parallel superstition cited by Lehmann: "Die thessalischen Weiber konnten durch Salben Menschen in Tiere oder Steine verwandeln." (Aberglaube und Zauberei, 50.)

[79] Laufer, *Amer. Anthropologist*, ii, n. s., 331-8.

[80] Yoruba-Speaking Peoples, 123.

[81] Manners & Customs of Modern Egyptians (Everyman's ed.), 256.

[82] Lehmann, *op. cit.*, 78.

[83] Savage Childhood, 66.

[84] Skeat, Malay Magic, 308-9, 283.

but only with that aspect of it which indicates a vague definition of the "self;"[85] hence a few typical cases will suffice. Among certain Gold Coast tribes members of the leopard family in particular believe that if the funeral custom is not well performed the deceased turns into a leopard and destroys the farms. Whenever a member of the family eats a plant called *susna* he turns into a leopard. Again, if the family do anything in violation of the dead man's wishes he will turn into a leopard and plague them; "the founders of the different tribes believed that a man could change his form after he is dead and take that of his sacred animal."[86] This case involves a particular sort of metamorphosis, viz., metempsychosis, complicated with totemism. Somewhat more characteristic is the Yoruba hyena superstition. A man may assume that disguise at night to prey upon sheep and cattle and, if opportunity offers, upon human beings. "Such man-hyenas are believed to be able, by means of certain howls and cries to compel people to go out to them in the dark forest to be devoured. A similar belief is found in Abyssinia."[87] Among the Nagas of Eastern Assam there is a belief in tiger-men. "These tiger-men, who are in league with the demons, are also fortune-tellers, and are much feared. They have the power of changing themselves into tigers and in this manner revenge themselves upon an enemy by killing him and his pigs and his cows. When they wish to change back into men, the tiger-man's wife must throw her clothes over the tiger's head, and at once he will change back into his human form."[88] Recently among the Ekoi of Southern Nigeria a chief fell under suspicion of having, in the guise of a wer-leopard, killed several cows and goats. The town was about to rid itself of him summarily when a white man arrived and put a stop to the proceedings. Among the same people Chief Agbashan is a mighty elephant hunter believed to have the power of changing himself into an elephant.[89] The metamorphosis of twins into cats by night is a superstition reported from southern Egypt.[90] So firmly is the wer-beast fixed in folk-mind that it expresses itself in children's play. Thus a favorite game of boys in the Malay Peninsula is the *Hantu musang* (civet-cat demon), in which a boy is "hypnotized" and "turned temporarily into such a beast by possessing him with the 'hantu of the musangs.'" If kept so for an hour there is danger of his becoming a real musang![91]

About the metamorphosis of persons into other persons clusters a variety of beliefs and customs involving witchcraft, daemonism, mortuary rites, initiation ceremonies, the 'changeling,' the 'fountain of youth,' etc. Perhaps of all these the renewal of youth is the simplest and most naïve. For ex-

[85] Yet in passing we might suggest that Lippert's theory of metamorphosis into were-wolves as a survival of ancient cannibalism is, to say the least, fine-spun, and a capital instance of bending facts to fit a general hypothesis.
[86] Harper, xxxvi, *JAI.*, 182.
[87] Ellis, Yoruba-Speaking Peoples, 122-3.
[88] Furness, xxxii, *JAI.*, 465.
[89] Talbot, *Nat. Geogr. Mag.*, xxiii, 34.
[90] A. M. Blackmar, "*Man*," x, 25-9.
[91] J. O'May, Playing the wer-beast, *Folk-Lore*, xxi, 371-4.

ample, in the Tauna Islands (New Hebrides) it is believed that in the olden times people could cast their skins and become young again.[92] Hence the Middle Age legends of the Wandering Jew, and of Joseph of Arimathea who subsists for centuries by the possession of that supreme relic, the Holy Grail, are not purely local Christian myths. The Yorubas have a belief corresponding somewhat to European changeling tales. In one version a nine months old infant grows up to a big boy and eats all the food the minute his mother is out of the house; and changes back to his infant form when anybody appears. The natives ascribe such a phenomenon to spirit possession. It is really referable to uncertainty about the 'self;' for, as we have already seen, the Yorubas also believe in wer-beasts and other phases of metamorphosis. Ellis refers to the "Father of Eighteen Elves" in Arnason's collection of Icelandic legends for similar stories.[93]

In all times one of the prescriptions of divinity or magic has been power to transform the 'self' of mortals. Thus Athene changed Ulysses into a beggar.[94] And one of the most hateful powers of Middle Age witchcraft was the ability to change a man into a maid, or *vice versa*. Divine power and magic could confer invisibility also by metamorphosis; but such metamorphoses were usually only a temporary device, unaccompanied by any real change in the person. Yet the fact that by donning a Tarnhelm one could see and not be seen still further illustrates primitive notions of the protean elasticity of the self. Initiation into the calling of magician or into a savage secret society was usually accompanied by a change in personality. Thus in West Africa the youth who is a candidate for initiation into the secret society is isolated and subjected to strict discipline, the whole purport of which is his death to the old life and resurrection to a larger life. He becomes a new man; even his name is changed; sometimes he learns a new language; he forgets or pretends to forget all his past life, even the commonest details of manners and customs; sometimes he must be taught even to walk and to eat.[95] In view of such qualities of mind as we saw in the

[92] Gray, *Intern. Archiv. für Ethnographie*, vii, 232.

[93] Yoruba-Speaking Peoples, 120-1.

[94] Odyssey, xvi, 194 ff.

[95] Similar customs in New South Wales, Queensland, Fiji, Congo Basin, New Guinea, Cerain, India, etc. See Lippert, Kulturgesch, ii, 341-2; Frazer, Golden Bough, ii, 342-57; *id.*, Totemism & Exogamy, i, 43-4; Chevrier, *L'Anthropologie*, xvii, 372-3; Kulischer, *Zts. f. Ethnologie*, xv, 194 ff; Bentley, Life on the Congo, 78 ff; Lawson, Hist. of North Carolina, 381.

Bororos, I am not sure we can call such customs *pretending* at all: the emotional coloring to belief may here easily beget a real experience of transformation, the birth of a new 'self.' Jones in the article already cited on the Algonkin Manitou shows clearly how just this emotional coloring *socially produced* determines the notion of the person in contact with that great vague but pervasive power in extension of the person which we have noted under the term manitou, mana, and the like.

Much more difficult of interpretation are cases of primitive impersonation. We are always at a loss to know how much is mere mimetic and how much genuine transformation into the part played. Take, for instance, a case from modern Servia. Prince Lazarovich-Hrebelianovich speaks of a curious invocation of the "Dodola," the mystic demi-goddess, personified by a gypsy girl, in whose keeping are the waters of springs and streams.[96] Or again a case from India:

"On the death of a Dewan or of a priest a curious sport is customary at the funeral. The corpse is conveyed to the place of cremation on a car; to this car ropes are attached, and the persons attending the ceremony are divided into two equal bodies and set to work to pull in opposite directions. One side represents the good spirits; the other the powers of evil. The contest is so arranged that the former are victorious. Sometimes, however, the young men representing the demons are inclined to pull too vigorously, but a stick generally quells this unseemly ardor in the cause of evil."[97]

Here in this crude sort of morality play there seems to be a survival of old notions of interchange of personality between men and good or evil powers. The obvious display of sympathetic magic may easily reach back to more primitive notions of contact with that vague impersonal energy or *mana*.

From modern Russian ethnography comes a description of a Mordva burial custom which even more clearly illustrates the realistic interchange of personality:

"The funerals wind up with a feast, songs, and sometimes dance. At harvest they leave on the field some bits of unharvested grain for the dead. There is a memorial of the dead on the 40th day especially, and frequently later. On the night before the 40th day, they clean up the house, repeating, "The father is coming, he will scold us." Early in the morning a person of the same age as the deceased goes to the cemetery; the others go to the courtyard where the ox destined for the memorial awaits his destiny; they make obeisance to

[96] The Servian People, i, 75-6. The Dodola, he says is "certainly a survival from remote pagan times, when the children of men were the children of nature and felt themselves in very near communion with the trees and hills and the forces of sun, wind, and water."

[97] Lewin, Wild Races of S. E. India, 185.

him to the waist; the women cover his horns with a cloth or bunch of grass; then they begin to lament, bowing to the ground before the ox. The ox led to slaughter represents the deceased. He is slaughtered by the nearest relative of the deceased, and cooked in a kettle with clear water. . . . After slaughtering the ox, they go into the cottage, where some prepare the meal for the expected guest, and others spread out on the lavka the clothing left behind by the deceased, in such a way as to represent a human figure . . . [then follow details of the feast preparations] . . . having prepared all that and lamented over the representation of the deceased, the nearest relative gives to all a cup of vodka or beer and invites them to go for the deceased. The guests make a deep obeisance, take the clothing, and with lamentation, go out into the procession. When they reach the grave they all fall down upon it, kiss the ground, and call the deceased. Then the Mordvine who had been sent out thither early in the morning speedily presents himself amongst the weeping relatives; the whole company flock about him with shouting, put upon him the clothing which they have brought, and taking him by the hand lead him back to the village. There they give him the lighted candle; they open the doors of the cottage; all make obeisance to the threshold and lead the pretended deceased with respect into the cottage, where they seat him in the front corner; the master or mistress of the house gives him a cup of vodka, or beer, and while he drinks all kneel before him on one knee, bending down their heads and leaning on the floor with one hand; then the master of the house entertains the guest. During this the guests go in turn to the pretended deceased, bow to him with reverence, and ask him about life in the other world. He offers each a glass of beer and gives them all reports about their relatives in the other world; thus: Yours has grown poor by spending; Yours keeps bees; Yours has become a drunkard; Yours has gone on a journey for his health. After the feast, they light a candle, around which the women stand and begin to weep for the guest, wishing that he may have light; then the company escort the guest to his own place. When they come to the cemetery, they take the clothing off him; thereupon he loses his fictitious character and sits down with the rest around the food which has been brought."[98]

It is said that the origins of Greek drama are to be found in ancient mimetic tomb-rites. They were probably of just the Mordva or even cruder type at first, and gradually, through aid of masks and other fictive means, attained independence and established themselves as a conventionalized art. Indeed probably all dramatic art rests on just such a realistic base, and gains, or at least gained its power from the *real transformations* ascribed to the actors' personalities. In the tomb ceremonies the living are conceived as investing themselves with the personality of the dead. But in the case of the Servians the person represented was conceived as living. Hence, in view of what we have already seen of primi-

[98] Russian Ethnography, 274 (transl. by W. G. Sumner in Mss. note); cf. Abercromby, Pre- and Proto-historic Finns, i, 177-8, quoting Smirnov.

tive thought, it is not difficult to conceive of 'mimetic identification' between the living and either the living or dead. Of course it is difficult to determine just how much is realism and how much only make-believe; but we may venture to say that at some time or other concrete realism predominated. It is significant that even in Plato's day philosophers could fear the metamorphosis of the actor into his rôle.[99]

It may not be out of place here to recall to mind such modern survivals of belief in metamorphosis as the change in personality of the priest when he dons his ecclesiastical vestments, the judge when he puts on his robe and mounts the bench, the convert when he claims "entire sanctification," the dogma of papal infallibility resulting from a mysterious interchange of personality between the pope and the Godhead; or finally the policeman when he lays aside his humanity and his citizenship to become the 'personification of the law,' and tells you with shocking naïvete that he tortures a suspected prisoner with the 'third degree' not as a man but as an officer!

IV. Widely scattered and unpromising as the materials may have seemed at first sight, they have yielded several important suggestions on the historical side of "human nature." In the first place we must have been impressed by the large rôle of the feelings in coloring primitive perception and especially the perception of the "self." This emotional coloring taken together with ignorance of the scientific order of nature expresses itself in a vague mystic outlook on nature in relation to the human self not very different from that expounded by Emerson in his Essay on Beauty.[100] The lack of sharp dualisms in primitive thought, in spite of the apparent absurdities to which it leads, may turn out to be not so absurd after all; especially the failure to distinguish rigidly between *ego* and *alter*. As an aspect of this primitive monistic thinking we must not fail to note its subordination of the individual self to that of the group. This we found reflected

[99] E. g. Plato, Republic, Bk. iii (Jowett): "the same person will hardly be able to play a serious part in life, and at the same time to be an imitator and imitate many other parts as well . . . human nature, Adeimantus, appears to have been coined into yet smaller pieces, and to be as incapable of imitating many things well, as of performing well the actions of which the imitations are copies."

[100] "Men hold themselves cheap and vile: and yet a man is a fagot of thunderbolts. All the elements pour through his system: he is the flood of the flood and fire of the fire; he feels the antipodes and the pole as drops of his blood: they are the extension of his personality."

in primitive communism and in those broad definitions of kinship which indicate the merging of the individual into the totem-clan, Cult-Bund, or other group; and as a resultant, closely knit group solidarity. It appears, too, that the notion of the individual soul and its priceless worth came only long after the general sense of the 'self' as a member of human and cosmic society. Furthermore, we seem justified in concluding that the militant sense of self-as-property is a characteristic lacking in primitive men; that it is a characteristic acquired in the course of comparatively recent industrial evolution; hence, that it is modifiable. As to the possibility of modifying the human self, the widespread belief in metamorphosis seems to yield emphatic affirmation and is too deep-seated to be utterly repudiated. The phenomena of religious 'conversion,' of 'double personality,' of hypnotic suggestion, or of even more normal and commonplace educational experiences indicate that it may still retain a valid place in our thinking. Could we once peer into the depths of that dim valley, the subconscious self, we might well be startled at the undreamed-of possibilities of transformation and metamorphosis. But the final and most important conclusion from the ethnographic data we have gathered is that the sense of self is essentially social and that as the mind is a working unity, so the concept of self reflects this totality of mind—feelings, ideas, desires, percepts, concepts; and is controlled, shaped, and colored by it.

A MARKED CASE OF DOUBLE INVERSION[1]

By GEORGE F. ARPS, Ohio State University

I. Statement of the case and its family history
II. The subject's school record
With reference to letters and words
With reference to digits
III. The subject's response to unfamiliar words
IV. Tests in visual perception and tactual arrangement
With cardboard letters
With geometrical figures
With one and two place numbers
V. Tests with the symbols viewed through the pseudoscope
When symbols were presented in normal space order
When symbols were presented in inverse space order
VI. Tests with familiar objects viewed through the pseudoscope
Knife and chalk presented in different space relation
Pencil presented in horizontal plane with rubber tip, first to right and then to the left
Pencil presented in the vertical plane with rubber tip, first to the top and then to the bottom
VII. Theoretical considerations

I. STATEMENT OF THE CASE AND ITS FAMILY HISTORY

The case here described is that of a small boy reported to the department of psychology by a teacher in one of the villages of Ohio. James entered the first primary and, at the time of writing, was seven years old. His ancestry is questionable, especially on the maternal side as the accompanying chart indicates.[2] The father, though ignorant and dull, bears a fair reputation for honesty and sobriety. The mother is illiterate, profane, intemperate, and was, prior to her marriage immoral as the family history shows. The

[1] A paper read before the Ohio College Association at Columbus, Ohio, April, 1915.

[2] The chart and family history were prepared by Mrs. W. J. Koster, of the Bureau of Juvenile Research, Columbus, Ohio.

field worker estimates the mother's mental age at seven or eight years while her boy, according to the Binet scale, tests out five and one-half years. Reference to the chart shows that James' grandparents on the maternal side were feeble-minded; that the grandmother on the maternal side was feeble-minded; that his mother and father are probably feeble-minded; that of two living sibs one is feeble-minded and the other at three years of age does not talk.

JAMES V.

III 5. James V., born Sept., 1907, in Ohio. Started to school in Sept., 1913; when he began writing, he wrote upside down and backwards. Child is small for his age, slender. Has clear brown eyes. Mother says he is susceptible to colds. Seems fairly bright considering surroundings. James is the oldest of his fraternity. The sibs are:

III 6. Flossie V., born 1909. Has a marked speech defect. Not averse to "showing off." Copies letters right side up, but is left handed. Has not yet gone to school. Seems of less than normal mentality. (Perhaps of the intelligence of a 4-year child.) Has brown eyes and hair. Small for her age.

III 7-8. Frank V. and twin, born 1911. Frank's twin died of pneumonia when small. Frank is over three years of age, and makes no attempt to talk. Clear brown eyes. Is plump, but mother says he is sick a great deal.

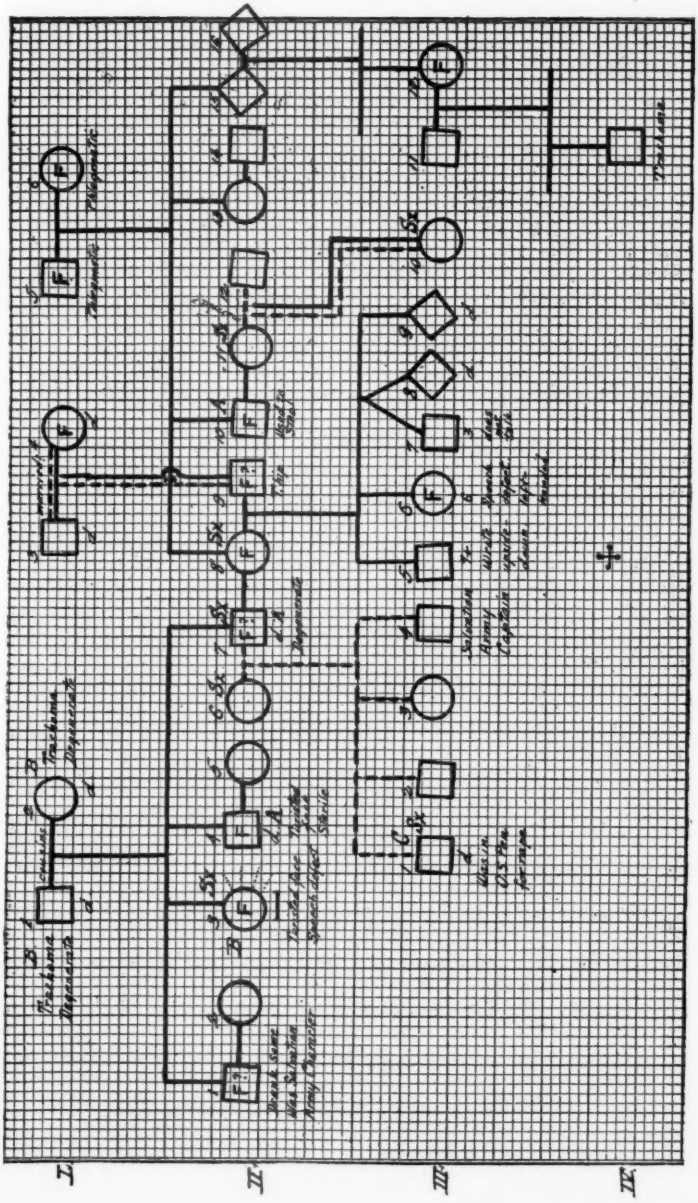
III 9. A baby born April, 1914, died Aug., 1914.

Father of III 5:

II 9. James V., Sr.—A small thin man, lame from tubercular hip; black hair, blue-grey eyes. Is ignorant and opinionated; doubtful if he is of normal mentality. Said to be a hard worker; doesn't drink, is not immoral. "Well-meaning." Chewed tobacco as he talked. Was disposed to be irritated because of the attention given his boy's case. It seems that the boy was kept out of school, as a trachoma suspect at the same time this mirror-writing tendency was discovered; and the father is not able to separate the two facts. Talked to me during my whole stay, insisting that nothing was wrong with the boy's eyes, and that no child could write correctly who had only been in school nine weeks. "They make them write letters before they know their A-B-C's now." I could not make him see why the case had attracted attention,—he was persistently obtuse (really or intentionally), as far as this was concerned. Railed querulously at Dr. Pomeroy and the State Inspector, for having suggested that anything was wrong with the child's eyes.

Lives in a poor, dingy neighborhood near the river. II 9 is the son of I 4, ——— V. She was a hardworking woman, not of high mental calibre. She was spare, bent and worn when informant knew her. Did washing to support herself and son. She claimed to be a widow, but it was not known that she was ever married.

Mother of III 5:



II 8. Mrs. Lucy V., age about 42. Lives in same town as James V. Poor neighborhood. House dirty and in some disorder. Since the flood, 1913, the family has been living in two rooms, which were replastered.

Mrs. V. is an untidy, frowsy woman, of low mentality (7 or 8 yrs.). She is rather stout, with pendulous abdomen. Brown hair and eyes. Chews tobacco as she talks. Seems amiable enough. Formerly immoral; never had venereal trouble. "Too dirty to catch anything," my informant said. During the 1913 flood, she had staying with her, a niece, III 12 ——— ———, with her family. This niece was feeble-minded. Was, if anything, dirtier than Mrs. V (II 8),—was positively filthy. This niece had a son, Chas. ——— (IV), who had papillar conjunctiva, and was taken to Columbus by the Blind Commission to be treated for trachoma. It was on account of close association with this boy, Charles, that James V. (III 5) was kept home as a trachoma suspect.

II 7. Lucy H. (II 8) was twice married. Her first husband was II 7, Si W. II 7 was an immoral degenerate (doubtless feeble-minded), who finally died of acute alcoholism. This Si W. was the son of I 1 and I 2, cousins, both degenerates, and both finally blind as a result of trachoma. These parents themselves are said to have been the result of inbreeding. Both are now dead. Si W. had three sibs of whom we know something. These are:

II 1. Alvin W. ("Chickie"). Lived near James V. Was a Salvation Army character. Drank some. (Probably of less than normal mentality.) Was married, but had no children. (Probably sterile.)

II 3. Jane W. Lived near James V. Now in County Infirmary. She is feeble-minded ("Never had any sense"), and before being taken to the Infirmary, was "common property." There is a suspicion of sterility here, as in spite of her sex activity, she never became pregnant. She has a marked speech defect. Her face is much twisted (asymetrical). She has conical cornea, and is nearly blind.

II 4. Dave W. Lived near James V. He was not considered bright. Face badly twisted ("could talk into his left ear"). Was a hard drinker and finally died of acute alcoholism. Was married, but had no children. (Probably sterile.)

Si W. (II 7), before his marriage to Lucy H. (II 8), ran with a woman named ——— S. (II 6), and she had four illegitimate children, presumably by him. These children were:

III 1. Clyde S. (illegitimate son of ——— S. and Si W.). Was in penitentiary for attempted rape. This was 25 or 30 years ago. The girl who made the charge was an immoral person; many think Clyde should not have been sent. Clyde died unmarried.

III 2. Walt S. Lives in a small Ohio town.

III 3. Stella S. Lives in same town as Walt S.

III 4. Jennison S. Lives in same town as Stella S.; is a Salvation Army Captain. A pretty decent man. Speaks on street corners.

Si W., II 7, later married II 8, Lucy H., but they could have no children. After Si's death, II 8 married II 9, James V., and they have five children, III 5, 6, 7, 8, 9, already described.

Lucy H., II 8, is the daughter of I 5 and I 6, ——— and ——— H. They were heavy set, phlegmatic, German people of less than normal intelligence. Lived on a farm. Lucy has three sibs of whom we know something. These are:

II 10. Sam H., a feeble-minded alcoholic, who in his younger days was also a thief. He married II 11, Kate K., an immoral woman, with an immoral daughter, probably illegitimate. Kate is brighter than her husband.

II 13. Jane H., married II 14, "Bluebeard A.," an old man many years her senior. They lived near James V., but have moved away.

II 15. ——— H., parent of the woman whose son was sent to Columbus for trachoma treatment.

This chart represents parts of three families,—The W.'s, V.'s and H.'s,—all of which are hardly up to the normal in intelligence. They are, for the most part, fairly industrious and inoffensive, and have given comparatively little actual trouble.

II. The Subject's School Record

During the first month of school James seemed hopeless; the only response made for this entire period, after many solicitations, was a statement of his name. He attempted neither writing nor reading and when threatened grew nervous and convulsive. In response to verbal symbols he seemed to be confronted with situations entirely foreign to his previous experiences. He usually withdrew from other children during the period of play except for an occasional game with smaller children whom he often bullied and abused.

At the end of the fifth or sixth week of school the teacher won his confidence sufficiently to induce him to attempt a copy which she had written on the blackboard. It was then discovered that the child invariably perceived the letters of the copy upside down and backwards. From this time on until Christmas all his writing, whether digits or letters, was inverted with respect to the up-down and left-right space relations, except in the case of the word 'cow' which he had painfully learned to trace. In three more weeks the words 'come' and 'me' were added, but very imperfectly. The constant tendency to inversion in the case of these words persisted as is shown by the frequent reversion to incorrect writing.

Unfortunately the earliest writings of the child were destroyed. The following specimens of his somewhat later writings are typical of the character of the writing of this period:

The words 'cow' and 'come' were copied in this manner—ʍoɔ, ǝɯoɔ.

In regard to her earlier efforts, the teacher has the following to say: "For days and weeks I tried to get James to write the word 'cow.' I had him go to the board and trace and retrace the copy with his fingers, then with chalk over and over again. Then he was asked to write the word with chalk or pencil as he had traced it; but invariably it was written in inverted order. One afternoon he succeeded, but the next morning all trace of the former success had disappeared." This oscillation of success and failure with reference to the practice word (cow) continued with decreasing number of failures until the holiday recess when he was fairly certain to write the practice word correctly. At the close of his sixth month of school James had learned to write with a fair degree of certainty the drill words 'cow,' 'come,' 'me' and 'James' with the letters in the usual up-down and left-right space relations.

The inversions peculiar to letters apply equally to eight of the nine digits. These were written as follows: ƨ, Ɛ, ⊬, Ƽ, 9, ∠, 8, 6.

The above account indicates a slow reconstruction of the left-right and the up-down directions. Unfortunately a complete history of the learning of the drill words is not available for the reason that the case was not immediately reported upon discovery. From the available material it is clearly evident that the reconstruction of the inverted directions does not take place simultaneously. Of the two inversions the left right is the more persistent, is less amenable to corrective experience. The reverse might be expected since the horizontal movements of the eye and arm are more readily made. It would seem, therefore, that the similar movements would be more readily coordinated into a system of space relations than the up-down movements of the eye and the forward and backward movements of the arm. But this is not the case. The earliest evidence of corrective experience is found in the up-down relation. Occasionally the digits 6, 7, and 9 are written as follows: ბ, ⅂, ϱ The word 'cow' after weeks of effort is frequently written, 'woc.' In these cases it is obvious that the error for the up-down position has disappeared. But this correction is not permanent; the curious phenomenon of oscillation, mentioned above, recurs in that certain writings of the same words or digits are free from this error while others are not. At the end of the seventh month of school a few of the writings of the drill words and the digits still show both kinds of inversions; more of the

writings show only the up-down inversion; while a very small number of writings are spacially correct.

III. The Subject's Response to Unfamiliar Words.

With reference to the practice words, once they were mastered, James responded with the usual promptness and confidence characteristic of a seven-year-old child. With reference to new words as 'me,' 'go,' 'nest,' 'see' and 'not' it was very difficult to secure a response of any kind. When asked to copy the word 'nest,' which the teacher had written on the blackboard, he appeared non-plussed, confused. After much persuasion he wrote the letter 't' but refused to write further. The word 'see' was then written on the board and copied as follows—' . The word 'not' was next written and copied as follows—'ton.' The teacher wrote other words on the board, such as 'bring' and 'buy,' but no amount of coaxing or solicitation could induce him to undertake a copy.

The words 'see,' 'not' and 'go' contain literal elements not entirely new; such letters as 'e,' 'o' and 'n' were met in the practice words, 'cow,' 'come' and 'in.' Hence we find him making attempts to copy these words. But in the words 'bring' and 'buy' the right-hand letters, 'g' and 'y,' with which the writing reaction in the case of James must begin, are strange and unfamiliar. Moreover, the letters 'g' and 'y' are intrinsically difficult.

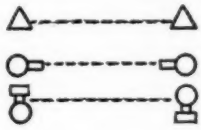
IV. Tests in Visual Perception and Tactual Arrangement

The purpose of these tests was to determine to what extent tactual and visual perception of directions cooperated in the reconstruction of the subject's up-down and left-right relations of individual letters, of letters in words, of individual digits and digits grouped in two and three place numbers. Geometrical figures were also employed. To this end the teacher cut out the letters of the alphabet and the nine digits from stiff cardboard paper. The various geometrical figures were cut out of sand paper.

The cardboard letters, 'c,' 'o,' 'a,' 'w' and 't' were now placed successively in the subject's hands carefully screened from view. Each letter was twice carefully identified to make sure that it was accurately apprehended. The word 'cow' was then written on the blackboard and James was asked to spell and pronounce it. Immediately after this he was asked to arrange with his fingers the letters, 'w,' 'o' and 'c,' which had been placed promiscuously in his hands, according to the order in which he perceived them on the

blackboard. The letters were carefully screened from view while he arranged them on a table before him. A like procedure applied to the words, 'come' and 'cat;' to the digits, 7, 6, and 4; to the geometrical figures, ; to the letters, 'm,' 'w,' 'y,' 'a;' and to the two and three place numbers, 45, 69, 37, and 456, 679, and 283. The results are as follows:

Visual Copy	*Tactual Arrangement*
come	we
cow	wo
cat	ta
M	W
W	M
Y	ʎ
A	∀
7	ㄥ
6	ϐ
4	ㄣ
45	⅁
69	69
37	⅀
456	459
679	6*6
283	ƹ8ƹ

Visual Copy	*Tactual Arrangement*
	

The experiment was then repeated twice for each of the words, 'come' and 'cow,' with the following results:

Visual Copy	*Tactual Arrangement*
come	omə, ow
cow	mo, wc

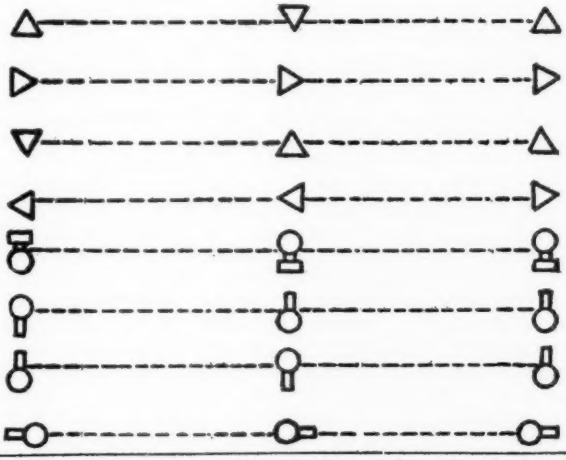
V. Tests with Symbols Viewed Through the Pseudoscope

In these tests the pseudoscope was placed on a box in a position parallel to the line of sight and focused on a definite area of the blackboard. Within this area all letters, words, digits, two and three place figures, and geometrical forms were sure to fall within the visual field of the pseudoscope. The same symbols were employed as in part III with the addition of the word 'rat.' The method of presentation follows that of part III except that in this experiment the sym-

* The 7 in this group of numerals was reproduced in inverted and mirrored form, *i.e.*, the horizontal bar of the 7 was downward and it was turned to the left.

bols were exposed in two series. In the first series they were written or drawn on the focal area in their proper spacial relations. In the second series they were written or drawn in such a way as to invert the normal space relations, *i. e.*, they were presented upside down and backward. The results follow.

Symbols	*Seen through pseudoscope when presented in the normal space relation*	*Seen through pseudoscope when presented in inverse space relation*
cow	cow	woɔ
come	come	ɔɯǝ
rat	rta	ʇɐɹ
cat	ʇɐɔ	tca
7	7	∠
6	9	9
4	4	↊
M	M	W
Y	⅄	⅄
A	A	∀
45	4ς	ς4
69	*6	6†
456	45*	9ς4
679	6ϛ9	6ϛ9
283	28ε	ε82



* The six appeared in inverted and mirrored form, *i.e.*, the loop was upward and was turned to the right.

† The nine appeared in inverted and mirrored form, *i.e.*, the loop was downward and was turned to the left.

The results of the pseudoscopic tests confirm the observations made under normal conditions. Here as there the phenomenon of oscillation is evident; that a slow process of reconstruction of space relation in response to school demands is going on is also evident.

VI. Tests with Familiar Objects Viewed Through the Pseudoscope

In these tests three common objects were employed—a piece of common chalk shaved down on opposite sides, a pocket knife and a rubber capped pencil. The pseudoscope was again placed on the box and the objects brought into the field of vision. Five readings were taken of each of the following positions:

1. With the knife on top of the chalk.
2. With the chalk on top of the knife.
3. With the knife to the right of the chalk.
4. With the knife to the left of the chalk.
5. With the pencil lying on the table with its rubber tip to the right.
6. With the pencil in the reverse position of "5," *i. e.*, the rubber to the left.
7. With the pencil placed vertically with the rubber at the top.
8. With the pencil placed vertically with the rubber at the bottom.

With respect to the knife and chalk, James was asked at one time to locate the knife with reference to the chalk; at another time he was asked to locate the chalk with reference to the knife. Chance order was followed both with respect to the position of the objects or object and to the interrogations. In case the knife was seen on top of the chalk, he was asked to respond by raising his right hand; in case it was seen to the left, he was to respond with the left hand and so on through the series. Previously it was determined whether James clearly understood what was meant by 'top,' 'bottom,' 'right' and 'left.' The results are shown in the following table:

TABLE I

Position of Objects..	+	—	—	—	+	—	+	+	—	+	R	L	L	R	L	R	L	L	R	R	r	r	P	r	P	P	r	P	r	P	T	B	B	B	T	B	T	T	T	B
Response	C	C	C	C	I	C	C	C	C	C	C	C	I	C	I	C	I	C	C	I	C	C	C	C	C	C	C	I	I	C	C	C	C	C	C	C	C	C	C	C

+ means knife on top of chalk
— means knife below the chalk
"R" means knife to right of chalk
"L" means knife to left of chalk
"r" means pencil was placed with the rubber tip to the right
"P" means pencil was placed with the rubber tip to the left
"T" means pencil was placed vertically with the rubber tip at the top
"B" means pencil was placed vertically with the rubber tip at the botttom
"C" means correct response
"I" means incorrect response

In six unrecorded cases of left-right confusion the subject failed entirely to respond.

Out of a total of forty responses only seven errors were made. Of these errors six inverted the right and left directions. It is probable that these errors are such as would likely occur even in the normal child of seven years of age. Significant, however, is the fact that all errors, with one exception, should be of the left-right order, since it was observed above that the inversion of the left-right direction is more persistent than the up-down direction. It is also significant that the six cases in which the subject failed entirely to respond should be cases involving the left-right direction. This is suggestive of the first stage in the reconstruction in the space relation of letters in words. With the elimination of the up-down error James' writing parallels that of the common cases of mirror-writing.

VI. Theoretical Considerations

The curious mixture of errors, the peculiar alternation of correct with incorrect spacial relations presents an interesting problem in the reconstruction of space perception though a new association of visual and tactual elements. Reference to the experimental data indicates an inversion of the vertical and horizontal visual space relations, but this does not appear to be the case when the same relations are explored tactually. It is possible that touch operates correctively to the original visual experience so that the inverse visual relations take on the normal meaning of top-bottom and left-right relations.

In the seeing person the tactual and visual elements constituting directions form an incomplete fusion so that the relation between the two groups of elements is more or less lax. For this reason a given fusion may, through a change of conditions, be undone and an entirely new fusion may be reconstructed. This may be illustrated by an attempt to trace a figure by means of a mirror in which case the systems of visual and tactual directions must be differently associated than has hitherto been the case in experience. The experiments of Stratton [3] illustrate the undoing of the associative bonds which experience has established between visual and tactual direction; they also illustrate the reconstruction of a new association.

In the case here reported it appears that the original associative bonds between the visual and tactual systems of direc-

[3] *Psychological Review*, IV, 1897, 341-360 and 463-481.

tion were broken down and a new association established, whose sensory elements were the direct opposite of the original association.

What the teacher is apparently attempting here is to reharmonize disparate space relations through experience. In the normal individual there is probably more or less cooperation between visual and tactual space perception from the very beginning. Through experience this cooperation is made definite and effective so that the space relations gained through these two sense departments become fairly homogeneous. Under normal conditions the two sets of relations may easily be harmonized but in the case under discussion it may be assumed that the visual and tactual space relations were at first inversely related with respect to the normal order and for this reason the two sets of relations reharmonize with difficulty. Instead of correspondence and cooperation we find rivalry and antagonism —the verbal visual left-right and up-down directions contending with the corresponding tactual directions.

Under normal conditions the child just entering school has before him the enormously complex process of correlating the various sensations involved in forming accurate visual and tactual space relations common to words. The finer accessory movements of hand and eye involved in learning verbal symbols for the most part remain uncorrelated until the age of entering school. The underlying mental equivalents of tactual movements involving tactual local signature through experience take on the meaning of the mental equivalents underlying ocular movements involving visual local signature, or vice versa. The series of local signs meaning a given direction in one of these sense departments find a corresponding significance in the local signs of the other. The disparate sets of signs in the case here investigated appear in discord and the development of a fusion of disparate series of corresponding signs is delayed. The earliest responses of James seem to indicate that the meaning of a series of signs in one sense field stood opposed in meaning to the corresponding series in that of the other field. The opposition is clearly in evidence during the period of reconstruction under the direction of the teacher. The persistency of this opposition is evidenced by the " over and over again " tactual tracings of the initial, visually observed, words (' come ' and ' me ') and the oscillation of correct and incorrect writings. The reharmonization of the vertical and horizontal directions proceeded with unequal difficulty; the horizontal reconstruction is especially obstinate as is shown by its tardy disappearance.

The efforts of the teacher were thrown on the side of the tactual direction in an effort to bring about correspondence with the visual direction. The enormous number of tracings involved in learning the word 'cow' and the consequent indifferent success does not necessarily establish the primacy of vision for the vertical and horizontal position of digits, letters and the relations of letters in words. Since the tactual directions when tested independent of vision conform more nearly to that of the normal child's writing, progress in the case here described appears dependent upon the subordination of visual direction to tactual, *i. e.*, the visual space directions through the repetition of tactual experiences take on the meaning of the latter.

At first those reactions were eliminated which diverged most from the normal order; successive trials and errors is gradually bringing out of the confusion a fairly consistent and stable space relation of verbal elements and digits.

THE SIGNIFICANCE OF CLOTHES

By Sylvia H. Bliss

"The Horse I ride has his own whole fell: strip him of the girths and flaps and extraneous tags I have fastened round him, and the noble creature is his own sempster and weaver and spinner; nay his own bootmaker, jeweler, and man-milliner; he bounds free through the valleys, with a perennial rainproof court-suit on his body; . . . nay, the graces also have been considered, and frills and fringes, with gay variety of color, are not wanting. While I—good Heaven—have thatched myself over with the dead fleeces of sheep, the bark of vegetables, the entrails of worms, the hides of oxen or seals, the felt of furred beasts, and walk abroad a moving Ragscreen, overheaped with shreds and tatters raked from the Charnel-house of Nature, where they would have rotted, to rot on me more slowly."—*Sartor Resartus*, Thomas Carlyle.

Because of our confirmed habit of apparel the question, Why did we wear clothes? is seldom raised. Obviously as individuals, living in the twentieth century, we clothe ourselves because it is the custom; and further, to conserve the heat of the body and to satisfy the claims of modesty. Adding to these reasons the large share played by personal vanity the matter appears to have been settled out of court, leaving no cause for further prosecution of the case. But if we slip the noose of our habitual attitude toward the human race, regarding ourselves simply as members of the zoological genus Homo and related by ties of blood to all other living creatures, this unique and distinguishing habit of dress seems to require further consideration. Why does man thus add to nature?

Custom, the mightiest force operative to-day in the matter of dress, is invalid as a reason for the inauguration of clothing, custom being but the repetition of acts and observances already introduced. In view of the probable fact that the primordial home of man was in tropical or sub-tropical regions, and in the light of what we shall presently find to be the character of rudimentary clothing, the protection of the

Note.—In addition to the authorities named in the text the writer is indebted to the following works: "The History of Mankind," Ratzel; "The Races of Men," J. Deniker; "Woman's Share in Primitive Culture," O. T. Mason; "Cyclopædia of Costume," Planche; various articles in cyclopædias and magazines; and to Robert H. Lowie, Associate Curator of the American Museum of Natural History, New York.

body from cold can hardly have served as the primary motive. Even in a climate so harsh and changeable as that of South Australia where there is apparent need of protection the natives are totally naked or wearing only a body ring. Coming to the consideration of modesty as a reason for clothing we find ourselves upon no firmer ground. The manifestations of modesty or of shame at the violation of "physical self-respect" are by no means confined to one portion of the body. In different nations the head, face, breast, foot, knee, or finger tips must be covered in deference to decency, while among peoples accustomed to tattoo or paint the body it is considered immodest to appear without these decorations, to a Carib woman the omission of paint being a more serious offence than the failure to don her girdle. On the other hand it is related of an aboriginal girl in the valley of the Orinoco, that having put on a gown to please a European visitor, she was much abashed when a member of her tribe appeared, and hastily threw off the garment. Shame would thus appear to result from violation of custom and close study of the facts has led several writers, notably Westermarck in "The History of Human Marriage," to the conclusion that ideas of modesty are purely relative and that shame is not the cause but the result of clothing.

That the initial impulse to dress came from the desire to render the body more attractive is a conclusion receiving support from the science of ethnography which has established the fact that in the evolution of clothing ornament preceded dress. One authority states that "the first and most primitive mode of personal adornment is certainly that in which the body itself is adorned without the putting on of any extraneous objects whatever." And of these adornments it is conceded that the daubing of the body with coloring matter obtained from colored earths and the juice of certain plants is the most primitive. Nearly all peoples who go naked thus adorn themselves. Of the Australians, for example, it is said, "Even the poorest and most wretched do not forget to paint their bodies," and the Fuegians daub faces, hair, and occasionally the entire body with pigments, red, yellow, white or black.

It has been asserted that the scars and blood stains displayed by the returned warrior, serving as a mark of distinction and honor and further as a sex lure, constituted the first decoration, giving rise at length to painting and tattooing. In regard to the latter practice this theory finds support in the custom of the Papuans of New Guinea with whom tattooing

upon a man signifies that he has killed some one. From accidental to deliberate scarring of the body is but a short step.

The habit of ornamentation, if it may be thus designated, grew apace. Tattooing in all its varied forms, mutilation and deforming of the body, breaking and filing of teeth, objects inserted in the ears, nose and lips, elaborate arrangements of hair with ornaments attached, and at length strips of hide and sinew of animals and herbaceous twigs were fastened around parts of the body where there was a depressed surface, above a bony projection or a muscular protuberance—the neck, the waist, the wrists and ankles, "as is still seen among the Fuegians, Melanesians, Bushmen and Australians." Here we have the prototype of the girdle, collar, necklace, belt and bracelet. To these were attached secondary ornaments, shells, seeds, bones, feathers, fur and flowers, and finally a beast's skin to form a mantle hung from the neck and to the girdle were fastened leafy branches, pieces of bark, tiny aprons of human or animal hair, and coverings of feathers and grass, the rude beginnings of the skirt. A somewhat crucial matter and one begetting controversy is that of the origin of the fig leaf, loin cloth or apron. In the book of Genesis is probably the oldest attempt to account for clothing and there it is attributed to the sense of shame. "And the eyes of them both were opened and they knew that they were naked, and they sewed fig leaves together and made themselves aprons." Carlyle, with later knowledge and insight wrote: "Shame—as yet a stranger to the Anthropophagous bosom, arose there mysteriously under clothes;" and his conclusion is quite in line with the modern conviction that clothing gave birth to modesty. Several authors and especially Westermarck contend that the various coverings above enumerated are not for the purpose of concealment but to make prominent and draw attention to the parts of the body thus hidden, this being one of the most powerful means of sexual selection.

Some investigators find in the jealousy of husbands a reason for the origin of clothing while Havelock Ellis, in "The Evolution of Modesty," contends that it was the man who first covered portions of the body and this not from motives of modesty but for protection, his organism being the more sensitive and his activities of wider range. In view of the fact that loss of the tail and assumption of the upright position left the body peculiarly vulnerable this theory has much to commend it. A further view relating more especially to decoration, is championed by J. G. Frazer, in "The Golden Bough," and by Ernest Crawley in "The Mystic Rose," and

is to the effect that mutilation and ornament exert a magical influence over the various organs of sense and serve to guard and insulate dangerous bodily functions, being practically a "permanent amulet or charm." Others have called attention to the superstitious factor in clothing, which attributes to small objects and trophies a beneficial influence, "tending to produce in the wearer the attributes of the object or of the whole of which the object was a part."

Discriminating and applicable though these theories may be it is obvious that no one of them adequately accounts for the fact of clothing nor sufficiently explains its complexity and variety. It may be, as one writer suggests, that the ancient Britons painted the body with earthy pigments to check the cooling effect of free evaporation from the skin; that the Andaman Islanders plaster themselves thickly with mud in order to resist the attacks of insects; the skin mantle of the Fuegian, shifted to meet the varying winds, and the elaborately fitted fur garments of the Eskimo, are obviously worn in deference to rigorous climate; the gourd or sling of certain South American tribes probably serves as a protection from injury, and the exceedingly small pearl-decorated apron of the Kafir belle is doubtless worn as a means of attraction; vanity, aesthetic feeling, the desire for distinction and the motive of comfort play their part. But as the primitive clothing impulse manifests itself in such varied forms we are justified in retreating beyond these partial hypotheses to one more profound and fundamental which underlies and includes them all.

Too great stress must not be laid on the factor of use, on an assumed end determining the particular form taken by the primitive impulse to decorate or clothe the body. The doctrine of use as a factor in evolution finds less favor than formerly. In the language of Professor William Patten of Dartmouth College, "The use made of an organ can not be the cause of its origin, for the organ must be present in the first place, in some form or other, before any use can be made of it:" and while to-day we find man by reason of his acquired equipment of reason and foresight working toward definitely conceived ends, it is hardly reasonable to attribute to the primitive creature at the outset of the human career clearly defined motives which determined his acts. As has been pointed out by the naturalists Geddes and Thompson, human nature can not be rightly understood apart from the biological approach, and even in a matter apparently so far removed from the natural as that of clothing there will be found many analogies to

zoölogical and biological facts. Primitive psychological attitudes arise from what has been termed physiological thought and the instinctive inner urge prompting the acts of primitive man may be not inaptly compared to those special internal conditions which biologists recognize as determining local growths, organs and structure, lower down in the scale of life.

In order adequately to frame a philosophy of clothes it is necessary to view as clearly as possible man's place in nature. Though there are now on earth only isolated examples of hairy men it is probable that the primitive human being and certainly his precursor were covered with hair. We may or may not accept the Darwinian conclusion that the loss of our coat of hair was due to aesthetic reasons, "the members of one sex having chosen as mates those of the other who were least hairy," but the fact remains that man, as Carlyle said, is by nature a naked animal. Moreover he is, broadly speaking, the only naked animal. In the world of living things are displayed fur, feathers, thickened and colored hide, scales, various armors, and integuments, for the tree bark and for all plant forms fitness and beauty of investiture. Man alone is left with an incomplete exterior. His position in nature is anomalous. All other creatures are finished and complete, clothed and with instinct sufficient to form themselves an abode which remains unaltered with the passing of the ages. Man alone must supplement nature. He has progressed by reason of his incompleteness and to what extent his initial advance was due to the lack of a satisfactory and fitting exterior is matter for conjecture. The gods left man naked in order that he might clothe himself: unfinished that he might indefinitely continue the process of development.

Underlying all the various motives which apparently lead man to paint, tattoo, decorate and protect the body is the fundamental feeling of incompleteness, of dissatisfaction with self as it is, and clothing in its origin and subsequent development is the result of his attempt to remedy the deficiency, to replace what he has lost. The covering and ornament which human beings supply for the body stand in lieu of fur, feathers, and all the varied exteriors found in lower nature and further, serve like ends of protection and adornment. The fact of the reputed complete nakedness of certain peoples does not militate against this theory of the primary reason for clothing. While individuals may be entirely nude it is said that in no tribe do all the members remain constantly as nature left them. Study of "our contemporary ancestors" discloses, it is probable, most of the forms of adornment and body cover-

ing used by prehistoric man—complicated in many instances by contact of the savages with civilized races—and as might be expected there are peoples in whom the clothing impulse has not developed, or but feebly, going no farther than paint, the mutilation of some organ or the wearing of a necklace or belt.

Carlyle found the first spiritual want of a barbarous man to be decoration and while it is difficult to connect with any form of spirituality the all but incredible mutilations practiced by certain tribes, if we interpret spiritual want in terms of dissatisfaction with self we may indeed find in these primitive attempts to alter the body the germs of that discontent that is termed divine. The Bongo woman encouraging an exuberant growth of proud flesh to form embossed ridges on her arm, the Botocudos of Brazil with large flat discs of wood worn in slits cut in the ears and under lip, the Papuans and Australians perforating the nasal septum to hold a bone or stick, the Masai of East Africa with ear lobe enlarged to many times its natural size by a stretching stone, Chinese with compressed feet, Indians with flattened skull, are all impelled by motives deeper than those commonly imputed. Though the custom of deforming the body has all but died out in civilized races, clothing has until very recently strangely and often grotesquely disguised the natural form. During the fourteenth and fifteenth centuries it is said there was hardly a part of men's bodies that was not made to look deformed by their clothing.

Man's place in nature must be still further defined if we are to appreciate to the full the significance of clothing. Humanity appears to be a continuation of the main stem of life of which all lower forms are the branches. They diverged from the central stem, advanced a pace and became what Nietzsche would term the goals of nature, plant, insect, animal and bird, —man, according to the German philosopher's thought, being not a goal but a bridge. The life which was to become human continued to advance though divested of many possibilities. It is not necessary to accept all the implications of Bergson's philosophy in order to make use of his pregnant idea that life, evolving in the direction of man has abandoned many things by the way. Tendencies which were incompatible with the main trend of life were dropped and set up a subordinate line of development. Applying this conception to the matter in hand we may say that man has left far behind the possibility of a furred or feathered exterior, of blossoms, thorns, horns, tails, and countless other structures and appendages displayed by lower forms of life, plant and animal. It may be said

further—and here is the crucial point in our philosophy of clothes—that these structures, appendages and ornaments which are characteristic of life other than human, survive in man as subconscious dispositions which at various times in the world's history, some in one race and some in another, are embodied in his dress. Actual physical survivals of lower forms of life appear during the development of the human fetus. Certain of these disappear, others are modified to form working parts of the organism, while occasionally one persists as an atrophied structure in the fully developed human being. In the light of these facts we are warranted in assuming the presence of corresponding mental survivals.

The variety and vagary of garb are thus not due to mere whim and vagary of the human mind. Man is the epitome of all tendencies and the reason for the complexity of his clothing impulse may be found in the complexity of his mental inheritance which includes all that he has lost physically on the way to man. There is scarcely a covering in nature that has not been utilized or imitated in human apparel; there can hardly be found a protuberance or appendage that may not have served as the prototype for some form of human mutilation or adornment. Fur serves both savage and civilized man. Certain tribes of the Amazon basin fix a covering of feathers on their bodies, daubed with a sticky substance; other tribes insert feathers in perforations in the cheek or nasal septum, while feathers as adornment, especially of the head are found the world over and not least in modern civilized nations. There are striking simulations of horns, notably the head-dress of some African tribes, and in England what has been called "the preposterous horned head-dress" of the reign of Henry V. The student of costume will come upon many an arresting likeness of coronet, cockade, neck ruff, stock, and frill, plume, sash, and train, to natural organic characteristics of other creatures and it is interesting to note in passing that a caricature of the date of 1786, entitled "Modern Elegance," shows two women wearing the Bouffon, an exaggerated neckerchief of cambric, and above them the figure of a Pouter pigeon with characteristically inflated œsophagus.

Perhaps the most striking example of physiological habit surviving in man as a mental tendency is that of the tail. This appendage has been so often simulated that it has given rise to the fable of men with tails and even our modern sash and train may, without stretch of the imagination, be referred to a like lowly origin. The student of savage costume comes again and again upon instances of this addition to man's

natural equipment and while the claim may be made that this widespread habit is due to imitation of animals it may with greater reasonableness be attributed to the subconscious reminiscence of an actual tail. This view is strengthened by the fact that the tail-like ornament is often worn on the front of the body and quite naturally the conclusion is reached that the various forms of the fig leaf, apron and clout may be included in the same category. The tail being one of the most recent of our losses, physical vestiges of this appendage occasionally, it is said, persisting in man, the impulse to thus supplement the body is strong. Deeper than the ends which they serve is the reason for all forms of apparel.

This conclusion is applicable also when we come to consider the relation of clothing to the fact of sex. The doctrine of sexual selection—the development of beauty of coloring, ornament and the like through their influence in courtship and consequent increase through inheritance, has been subjected to much criticism since its promulgation by Darwin, but whatever theory finally prevails the fact remains that the attainment of sexual maturity and the arrival of the period of reproduction,—seasons which in all life but human are practically coincident,—are marked by all the beauty, elaboration, fragrance and exuberance of which the organism is capable. Secondary sexual characters such as manes, beards, crests, tusks and antlers, combs, wattles and top-knots, are acquired with the approach of sexual maturity and frequently are retained in their full glory only during the reproductive period. Of the deer it is said that the production of antlers is intimately connected with the generative function and in many birds there are developments peculiar to the breeding season, such as the great throat pouch of the male bustard and the egret's tuft of long and delicate feathers. The scent glands of many creatures are more active at this season, the beauty and fragrance of the flower—the flower itself—are signs of reproductive power, and the entire imago state of many insects,—that brief period of beauty that of all their life cycle is the only one known to most of us,—exists solely for the purpose of mating and depositing of eggs, the insects taking no food, the mouth parts of certain species being completely atrophied. With this heritage of tendencies it is but natural that man, the epitome of all lower life, should display a like close connection between the development of the sex function and exquisite attire and with his greatly lengthened period of courtship enormously increase the beauty and magnificence of his costume. Here again we are but carrying out laws which

in nature are organic. Antedating and underlying the conscious motive of sex-appeal is the instinctive impulse to beautify and adorn the body.

That it is the female who now, among human beings, is distinguished by beauty and magnificence of apparel is a fact which controverts biological precedent, for in other forms of life where the sexes differ the excess of display is generally with the male. This condition appears to have obtained also in clothing up to recent times and gradually gave way to our present "dead level of negative commonplace and drab, grave-like nonentity" for the reason that man, as clothing more and more covered the body, found the accumulation of drapery a hindrance to his strenuous activities. With the Romans two costumes were adopted, one for labor and one for ceremonial occasions and finally the utilitarian style dominated men's attire, the decorative function being represented by women's dress. It is probable that the modern male mind is influenced likewise by the motive which led Montaigne to discard the polychrome clothing of his age. He declared that he would not be bothered about deciding the color of his garments and so wore only black and white. In numberless ways has the primitive clothing impulse been modified to meet the contingencies of civilization.

It is easy to attribute change of fashion to mere caprice or to mercenary contrivance on the part of dressmaker and milliner. Easy and natural also to decry as vain or dandified the individual whose efforts are concentrated on exquisite dress. This is but a superficial view of the matter. In all his efforts of this character man is guided not only by the impulse to rehabilitate himself with all that he has lost on the way to the human level but to attain as well the absolute freedom, comfort, suitability and beauty of attire displayed elsewhere in nature. Dominated by this unconscious ideal he is dissatisfied with all ill-fitting, unsuitable, unlovely garments and age after age strives for the perfect human costume, one which for man shall be as fitting, natural and characteristic as the exterior of fur and feathers for animal and bird. But he rarely more than approximates this condition. Confronted with the difficulty of making his garb conform and give expression to an ever growing spirit he follows a flying goal. Setting aside the servile imitation which is the motive moving multitudes in their choice of garments we find beneath every important change of style a change of mental outlook. Our oft-derided fashion makers may be more closely in touch with

the spirit of the age than we dream, registering in their creations profound movements of the human soul.

The fact is significant that, generally speaking, in the East costume has undergone relatively little change as compared to the West with its mingling of peoples and where civilization is complex and unstable. The most rapid alterations of style attend on swift changes of ideas, ideals and conditions. In France where civilization has attained a very high point dress reaches its finest, most exquisite development. Countries isolated and homogeneous long preserve the distinguishing national costume while with the breaking down of individuality by mingling with other races the dress becomes heterogeneous and complex as at the fall of the Roman Empire and in the Japan of to-day.

In consequence of the instinctive desire for absolute fitness of apparel we find human beings inventing distinctive costume for every condition and occasion,—youth, age, rank, occupation, war, worship, the funeral and the dance. This custom has its beginning among peoples low in the scale of civilization, as the Fuegians, who use upon the body four colors of paint—red and yellow in token of friendliness, white as war-paint and black as a symbol of grief, and their neighbors the Patagonians who on the eve of the wedding night cover the body with white paint.

With the development of individuality there is corresponding development of variety in style in order to provide for each person a distinctive costume, but the human soul, too great and complex for its vestments, must go farther. Ordinary occasions do not provide scope for all its tendencies. Other selves within us must have their setting. In the pageant past times and personalities are rehabilitated and in the masquerade various conditions and occupations from which we are debarred actual participation, are for the moment, through the medium of clothes, made our own. In the masque also we may clothe our fantasies, moods and aspirations, the angel, devil, butterfly and flower within us each having its brief hour.

The era of distinctive national costume is passing. We are emerging from the dominance of blind impulse and entering upon the stage of preparation for a distinctly human garb. There are occasional efforts to break away from our modern complexity and elaboration and return to the noble simplicity of Greek attire,—the one perfect costume, as it has been called. But no one is able to forecast the future. The ultimate costume is as little predicable as the ultimate man.

A METHOD OF TESTING THE STRENGTH OF INSTINCTS

By Henry T. Moore, Dartmouth College

The over-rapid growth of mental tests during the past ten years has not infrequently raised the question whether psychology for the present can not more profitably confine its attention to standardization of the old than to encouragement of the new. But whenever one asks himself how to make mental tests of broad practical service to society, he is inevitably faced with a consideration which must dissatisfy him with the very limited reach of the tests at present available. Although much has already been accomplished in the differentiation of the feeble-minded, and much seems likely to be accomplished in the more scientific selection of employees for minutely specialized tasks, such as telephone operating and clerical work, still it is impossible to escape the conviction that such social needs as vocational guidance can never be greatly furthered by mere statistics as to mental acuity of various sorts in different individuals. Let us suppose, for example, that one man proves extraordinarily apt in all tests of perception, association, etc., but is found afterwards to be wholly lacking in curiosity regarding anything not connected with his animal needs; another man ranks only fairly well, or even below average, in the same tests, but possesses an all-consuming curiosity, which impels him to intense and sustained interests. It would surely be hazardous to predict for the first a larger measure of success than for the second. Indeed, it can hardly be expected that mental tests proper can ever be applied with conspicuous success to any positions which are not of a fairly routine character. The writer had occasion recently to ask a prominent physician to rate in order of importance for the general practice of medicine a large number of mental aptitudes, such as quickness of perception, logical association, rote and logical memory. The latter consented to make an estimate of the degree to which each was serviceable, but added finally that he thought that one might rank low in each of the tests, and yet find his way to the top of his profession; likewise, that one might rank high in each test, and yet make a decided failure. What is true of medicine is abundantly true of law, teaching, salesmanship, even of those occupations

in which the worker is in every sense an employee. In nine cases out of ten more depends on the amount of motive force and on the ability to make successful social contacts than on the ability to perceive, remember, and imagine.

If the hope of psychology is ultimately to offer solutions for practical problems, its tests will have to be concerned more than heretofore with measures of instinctive and emotional tendencies. To be sure, it may seem somewhat untimely to attempt to measure instincts, when there is as yet nothing like universal agreement as to the specific marks of an instinct, but there is at least a fairly general consensus of opinion regarding the more important ones, such as pugnacity, fear, and curiosity; and for the rest, the very effort at quantitative measurement ought to lead in time to more precise characterizations which will prove generally acceptable.

I propose, then, to take as a starting point a classification of instinct very like the one which has been offered by Mc Dougall in his "Social Psychology." We may limit ourselves to ten tendencies which are of great practical importance, and which are sufficiently specific to be termed instincts proper in his limited use of the term. We have, then, as traits to be measured: pugnacity, fear, repulsion, curiosity, self-assertion, self-abasement, tenderness, gregariousness, acquisition, and construction. If we can establish norms for each of these tendencies, and then test a given individual for an excess of pugnacity or for a deficiency in self-assertion, obviously we shall have made a beginning toward a kind of understanding, the social importance of which is not to be denied.

The method which has seemed to me most likely to display in their relative strength the above-mentioned tendencies, is a form of the association test. The subject is given as a stimulus some word strongly suggestive of a certain kind of emotional situation, and he is to react with the first verb form that occurs to him. The supposition here is that just in proportion as the emotion is frequently or strongly experienced by him, he will tend the more quickly and the more uniformly to respond with a verb reaction appropriate to the emotion suggested. Thus if one of the pugnacity stimuli, such as "enemy," "insult," or "attack," is given, a subject by nature very pugnacious may be expected to react with considerable speed, and with a verb-form indicative of resentment or attack. If one of the self-assertion stimuli is offered, such as "career," "success," or "achievement," a self-assertive individual may be expected to reply quickly, and with such expressions as "strive," "struggle," "attain."

Stated more in detail, the method of procedure is as follows. In a preliminary experiment the subject is given a series of twenty neutral words, such as "pencil," "leaf," "chair," etc., and is asked to respond with a verb expressive of his personal reaction to these objects. The average time for these twenty responses represents his normal verb reaction time. Instructions are now impressed upon him to the effect that in what follows he is to interpret each stimulus word as representative of a situation in which he is personally concerned, and that his reaction verb is to indicate an action in which he involves himself personally. With association controlled to this extent, he is supplied one at a time with one hundred stimulus words, by means of which each of the ten instincts is solicited ten times in irregular order. The subject's record for a given instinct will be an expression of the two factors of content and speed. In so far as it depends on content, it will be determined as follows. A reaction evidently provoked by the suggested emotion is scored by giving twelve points' credit to the instinct in question. If the stimulus brings forth a colorless word, which introspection proves to have been unaccompanied by any distinct emotional consciousness, the score for that reaction is zero. If the reaction expresses an emotion different from the one normally expected, as when a pugnacity stimulus yields a tenderness or fear reaction—such as "enemy-forgive," or "enemy-run"—the instinct of tenderness or that of fear is credited with the twelve points, and pugnacity with a zero. In these cases the overready instinct steals for itself extra credit at the expense of the weaker tendencies. It appears from the above that the total score for an instinct which provoked normal responses for each of its ten stimuli would be 120 points. The only variations possible, as far as the content of the reaction is concerned, are those which depend either on the number of neutral reactions, which are without score, or on the extent to which one instinct steals from another.

The score, as far as determined by speed, will depend on the extent to which the reactions connected with a given emotion are made in more or less than the normal verb-association time. For each increment of speed there should be a proportionate increase in credit, and for each retardation a proportionate decrease. Thus if the pugnacity reactions are made at an average of three-fourths the normal time, the total score for pugnacity, otherwise 120, now becomes 160. If the reactions average twice as long as normal, the score will total but 60 points.

Too much emphasis can hardly be laid on the need for giving careful consideration to the subject's introspective report on each reaction. This should be sufficiently detailed to make clear the following points:

(1) That the stimulus word is really interpreted as indicating a situation in which the subject finds himself personally concerned. It makes a considerable difference whether the word "danger" is interpreted as meaning my own personal hazard or the danger to the Mexican republic.

(2) That the verb is one which the subject seems to connect with his own activity. If the word "enemy" is replied to with "attack," it must be ascertained that the attacking is indicative of the subject's reaction toward the enemy, and not of his expectation from the enemy.

(3) That the reaction is not due to a chance association based on recent occurrences. The word "sports," which might normally call forth an expression of play, would, if recently associated with a serious accident, provoke an altogether different response.

Whenever the introspection points to the subject's failure in any one of the above three respects, it will of course be necessary to discard the results for that particular trial, and later in the test to introduce a substitute stimulus word. The introspective report will be further useful in determining whether the verb should be interpreted as colorless or as expressive of an instinct. For example, the word "is" implies emotional indifference when the introspection reveals nothing in particular. But when a subject reacts to "enemy" with "is," and adds, "Jones is my enemy, and I hate him," we have evidence of a pugnacity not adequately represented by the mere word form.

In calculating the score for fear and for self-abasement, exception will have to be made to the rule of deducting credit for slowness of response. The retardation for these two instincts may be due to the subject's natural disinclination to reveal his true emotion with complete abandon. Introspective evidence will have to be very carefully sought in these cases. A concrete instance taken from tests I have given will make clear this type of difficulty. One subject took twice the normal time to respond to "death" with "fear." Questioning elicited the following introspection: "My first thought was fear, but I tried to suppress this tendency, saying to myself that I would certainly not admit a fear of death. I was soon aware, however, that I could think of no other word for the

moment, so I reacted with it." The time which elapsed during this unsuccessful attempt to suppress a fear reaction seems to indicate more rather than less of the instinct. A fear which reasserted itself in spite of attempted suppression would seem entitled to double credit. Moreover, an additional credit should be assigned in this case either to self-assertion or to self-abasement, according to whether the motive for suppression was the effort to control or to conceal the emotion. The former motive would justify an extra credit for self-assertion; the latter, an addition to the score for self-abasement. Obviously it is out of the question to attempt any of the refinements of psychoanalysis in giving tests of a routine nature; hence it may prove ultimately that the only way to uniform scoring lies in discarding all trials in which there is evidence of inhibition of the natural response.

The writer has recently begun a series of instinct tests on a large number of Dartmouth undergraduates, the results of which will be forthcoming shortly. For the present a list of fifty characteristic stimulus words, and the record of a single subject for these fifty words will indicate the method in detail

RECORD FOR A SINGLE SUBJECT

PRELIMINARY EXPERIMENT

Neutral stimuli	Reaction	Time
cloth	cut	.6138 sec.
plate	eat	.5580
brush	brush	.4278
house	live	.6882
paper	cut	.5394
soup	eat	.5766
tree	see	.7254
pencil	write	.4278
chair	sit	.4836
bed	sleep	.8056
	10	5.8462

Normal verb reaction time .5846

FINAL EXPERIMENT (WORDS GIVEN IN IRREGULAR ORDER)

Pugnacity stimuli	Reaction	Time	Introspection	Score
enemy	face	1.0418		7
insult	avenge	.8186		9
attacked	feel	.3720	Thought of fear	See fear
battle	fight	.5394		13
slapped	hurt	.8744		See self-abasement
			Extra credits taken from others	0
			Total score for pugnacity	29

Fear stimuli	Reaction	Time	Introspection	Score
danger	hear	.2976		24
death	fear	.8558		8
terror	feel	.5952		12
rattlesnake	fear	.7812		9
murder	help	.5022	Called for help	13
			Extra credits taken from elsewhere	16
			Total score for fear	82

Repulsion stimuli	Reaction	Time	Introspection	Score
stench	smell	1.358	Disagreeable imagery	6
putrid	smell	.8000	Disagreeable imagery	9
filth	hate	.7068		10
sores	hate	.8744		8
slimy	hate	.6326		11
			Extra credits	0
			Total score for repulsion	44

Curiosity stimuli	Reaction	Time	Introspection	Score
news	hear	.7626		9
strange	see	1.3580		6
novelty	see	.8558		8
puzzle	meet	.6138	Meant to say solve	12
interesting	like	.7440		10
			Total score for curiosity	45

Self-assertion stimuli	Reaction	Time	Introspection	Score
career	have	.4092	Thought of personal career	18
success	have	.3720	Could not avoid word "have"	19
power	have	.5022		14
triumph	have	.4278	Thought of attaining success	17
prestige	like	.7812		9
			Total score for self-assertion	77

Self-abasement stimuli	Reaction	Time	Introspection	Score
chagrin	feel	.6138		12
remorse	feel	.5952		12
disgrace	feel	.7440		10
guilt	feel	.8930		8
punishment	have	.8930	Thought of having been punished	8
			Extra credits	8
			Total score for self-abasement	58

Tenderness stimuli	Reaction	Time	Introspection	Score
mother	love	.5440		13
home	find	.9302		8
family	love	.6882		10
sister	have	.7068	Have always desired a sister	10
parents	love	.6326		11
			Total score for tenderness	62

Gregariousness stimuli	Reaction	Time	Introspection	Score
crowd	push	.8560		8
alone	hate	1.0790		7
friends	meet	1.02322		7
strangers	meet	.9860		7
solitude	hate	.8186		9
			Total score for gregariousness	38

Acquisition stimuli	Reaction	Time	Introspection	Score
wealth	get	.8370		8
property	have	.3906		18
possessions	have	.3348		21
money	get	.8186		9
valuable	have	.6326		11
			Total score for acquisition	67

Construction stimuli	Reaction	Time	Introspection	Score
enterprise	begin	1.0970	The word "have"	7
plans	hear	1.1348	seemed to force its	7
vocation	have	.5952	way into every	12
system	have	.9488	personal	8
policy	have	.6696	attitude	11
			Total score for construction	45

When a large number of such records have been obtained, it will be possible to make an approximate statement regarding a given individual's emotional nature, as compared with that of his fellows. Whatever the shortcomings of the method here outlined, the demand which it attempts to meet seems to the writer imperative. That economists feel the urgent need of an exact treatment of the instinctive-emotional life is abundantly evidenced by the increasing number of books such as Taussig's "Inventors and Money Makers," Veblen's "Instinct of Workmanship," and Anderson's "Social Value," which manifest in common the tendency to refer economics back to a psychology of instinct and emotion. It behooves the psychologist to supply the economist for this purpose with far more precise instruments than those which have been heretofore available.

MEASURES OF VARIABILITY

By E. J. G. Bradford, King's College, London

When the same test is applied several times the individual tested may vary at each application, in the efficiency of his response. The standard measures of variability,—the Average Deviation, the Standard Deviation, and the Coefficient of Variation,—can all be used to measure the degree of the individual's variability. But all these measures, however efficient they may be for measuring variability within a group of individuals, have serious disadvantages when applied to the variability of the individual.

Since all three measures suffer from the same defects, a consideration of the Average Deviation (A. D.) may serve as a basis for argument. In the first place the deviations are calculated from the mean performance. Continued application of the same psychological test enables the individual tested to improve in efficiency. Thus, for example, the mean performance at the last two applications will be higher than the mean performance at the first two. There is, in fact, a general improvement in the mean performance,—or stated differently, the mean is progressive.

A more exact measure of variability, then, would be one in which the deviations were calculated from a progressive mean instead of from a fixed mean.

The diagram below represents the scores of two individuals A and B at ten consecutive applications of a controlled association test, the exact nature of which will be described later.

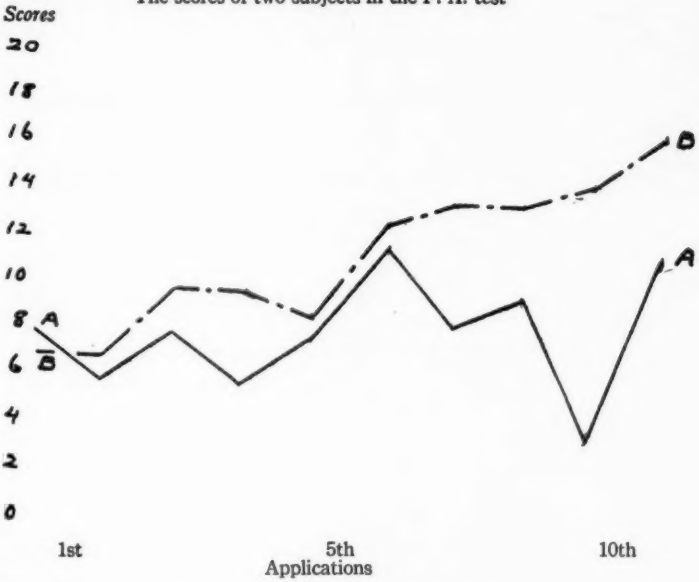
What strikes one on looking at the two series of results, is that subject A is more variable than subject B; for the line A certainly presents a far more irregular appearance than does line B, yet the means and A. D.'s of the two series are as follows:

A. Mean 8 [nearest whole number] A. D. 1.9
B. Mean 12 [nearest whole number] A. D. 3.0

Subject B shows a much greater improvement with practice than does subject A, and it is this improvement which results in such a large A. D. Herein lies the second great

DIAGRAM I

The scores of two subjects in the F. A. test



disadvantage of the A. D. If for psychological purposes we are to distinguish between variability and improvability, as seems advisable, the A. D. (or Mean Variation) must be discarded as a measure of individual variability. What is required therefore, is a coefficient of variability, which gives a measure of variability quite independently of the subject's improvability.

Consider the following case. A subject makes the following ten consecutive scores:

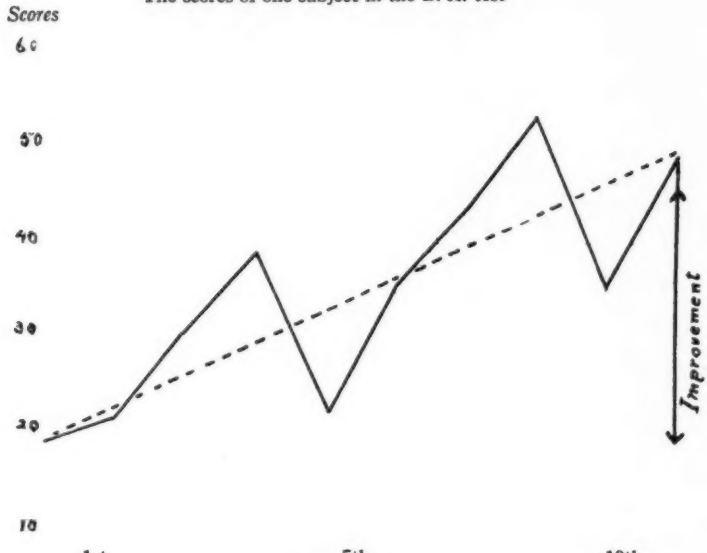
19,	21,	30,	39,	21,	35,	44,	53,	35,	49
	(2)	(9)	(9)	(18)	(14)	(9)	(9)	(18)	(14)

The total variability can be measured by taking the sum of the differences (figures given in brackets above) between every two consecutive scores. In effect this amounts to reckoning the variations from a progressive mean.

It can be seen more plainly from the graphed results of these scores (Diagram II) that the sum of the differences

DIAGRAM II

The scores of one subject in the B. A. test



between the consecutive scores has been increased by the total difference between the initial and final means. In other words it has been increased by the improvement shown between the first and last measures. Hence to correct for improvability it will be necessary to diminish the total variability of the total improvement.

Let n be the number of measures.
m_1 and m_n the first and last measures respectively.
Then
$m_n - m_1$ is the improvement due to practice.
and

$$\left\{\left(m_n - m_{n-1}\right) + \left(m_{n-1} - m_{n-2}\right) + \ldots\ldots + \left(m_2 - m_1\right)\right\}$$

is the total variability due to all causes combined.
Putting

$$m_n - m_1 = D$$
$$(m_n - m_{n-1}) = d$$

We get
$(\Sigma d - D)$ as the total variability due to causes other than practice.

For a small number of measures, or at least such a number as shall be well within the limits of improvement, we can take as the measure of improvability (i)

$$i = \frac{m_n - m_1}{n} \text{ or } \frac{D}{n}$$

As a measure of variability including improvement (vi) we have

$$vi = \frac{1}{n}\left\{\Sigma\left(m_n - m_{n-1}\right)\right\} \text{ or } \frac{\Sigma d}{n}$$

Then it follows that as a measure of pure variability (v) we get

$$v = \frac{1}{n}\left\{\Sigma\left(m_n - m_{n-1}\right) - \left(m_n - m_1\right)\right\}$$

or,

$$v = \frac{1}{n}\left\{\Sigma d - D\right\}.$$

The actual scores of subjects A and B (Diagram I) were:

A. 8, 6, 8, 6, 8, 12, 9, 10, 4, 12.
B. 7, 7, 10, 10, 9, 13, 14, 14, 15, 17.

The coefficients work out as follows:

	A.	B.
Mean	8.0	12.0
A. D.	1.9	3.0
vi	3.0	1.2
i	.4	1.0
v	2.6	.2

From these two cases it would appear that the A. D. is more a measure of improvability than of variability. This problem as to the relations between the different coefficients will be dealt with in the sequel.

To show the relations between the various coefficients of variability and incidentally their relations to ability, certain experiments were made, the methods and results of which are given below.

The Subjects. Two classes of boys from a good elementary school in London were tested. Of these classes, in scholastic attainments, Class 4 was a year in advance of Class 5. In both classes the average age was 11.0 years, for Class 4 $\sigma = .60$ years and class 5 $\sigma = .95$ years. Hence, although of the same average age, the more advanced class was the more homogenous with regard to age. The number of boys who completed the whole series of tests were 43 in Class 4 and 45 in Class 5.

The Tests. The tests employed were the Backward-alphabet test and the Forward-alphabet test. (Hereafter referred to as the B. A. and F. A. tests respectively.) The former test needs no description in that it is described by Whipple [1] and has been used by other investigators.[2] The latter test differs from the former only in that the letter succeeding the stimulus letter is required instead of the letter preceding the stimulus letter.

Procedure. The tests were applied three times a week, on Mondays, Wednesdays and Fridays, for a period extending over about a month. The subjects were supplied with a paper on which twenty letters were printed in a vertical column. There were three different orders for the letters so that there was an interval of a whole week between each application of the same list.

At the commencement of this series of tests 70 seconds was allowed for the B. A. and 35 seconds for the F. A. test. The time was gradually cut down till at the end the times were 35 and 25 seconds respectively. The scores were weighed proportionally to the time given, in each case bringing them up to the 70 and 35 second standards respectively.

The Relation Between the Two Tests. The table below gives the correlation coefficients between the B. A. and F. A. tests, as regards mean ability, variability and improvability.

TABLE 1

	Mean	A. D.	*vi*	*i*	*v*
Class 4	.77	.24	.42	.34	.40
Class 5	.86	.35	.32	.32	[.04]

For Class 4:
$v = 3$ P. E. when $v = .29$
$v =$ P. E. when $v = .11$
For Class 5:
$v = 3$ P. E. when $v = .28$
$v =$ P. E. when $v = .10$

In the above and subsequent tables of correlation coefficients, those coefficients which are less than three times the P. E.

[1] *Manual of Mental and Physical Tests.* 1910, 326.
[2] H. A. Aikins, E. L. Thorndike and E. Hubbell, *Psychol. Rev.* IX., 1902, 374 ff.

are printed in italics, and those which are less than the probable error are put in brackets.

It can be seen in the above table that there is a high correlation between the mean ability in the B. A. and F. A. tests. This is what might have been expected from the similar nature of the tests. Improvability (as measured by *i*), in the one test correlates with improvability in the other. The degree of correlation is not high but it is at least deserving of consideration since it is as great as three times the probable error; and it is approximately the same for both groups of subjects.

The coefficients obtained by correlating the variability (*v*) for the two tests shows that in Class 4 there is a marked tendency for variability in the B. A. test to be accompanied by variability in the F. A. test. On the other hand there is a marked absence of a similar correlation for Class 5.

Since both the *i* values and the *v* values show an appreciable degree of correlation between the two tests for Class 4, this would be sufficient to account for the fact that the *vi* values give a higher correlation than either of the other two separately. For Class 5 the *vi* values do not give greater correlation, this may be due to the fact that the *v* values for this class show practically no correlation at all.

The Relation between the Means and A. D.'s.—Table 2 shows that a high correlation obtains between the A. D. and the Mean in both tests and for both classes.

TABLE 2

	Correlation between Mean and A. D.	
	B. A.	F. A.
Class 4	.63	.50
Class 5	.40	.59

Does this high correlation mean that, generally speaking, variability is a function of ability; that the more able an individual is, the more variable he will be?

An answer to this question will be found in Table 3, which gives the correlation coefficients between the other measures of variability and improvability.

TABLE 3

	B. A. test			F. A. test		
	Correlation between Mean and:—					
	vi	*i*	*v*	*vi*	*i*	*v*
Class 4	[.03]	.48	—.24	[.07]	.38	—.11
Class 5	.23	.33	[.04]	.43	.74	[.00]

It is obvious that the answer to the above question is in the negative. For these two tests and for these two groups of individuals there is no marked tendency for variability to correlate with ability, either positively or negatively. None of the coefficients are as great as three times the probable error. The apparent exception to this generalization is found in the correlation between the Mean and *vi* for Class 5 in the F. A. test. This positive correlation is probably accounted for by the fact that the improvability factor which the *vi* coefficient contains, itself correlates very highly with the Mean.

The second point of note in this table is that in all four cases ability correlates with improvability; all four coefficients are greater than three times the P. E.

The Relation of Variability and Improvability with the A. D. A question which arises from the above considerations is, why should the A. D. correlate highly with the Mean, while *vi* and *v*, the other measures of variability do not?

TABLE 4

	B. A.			F. A.		
	Correlations between A. D. and:—					
	vi	*i*	*v*	*vi*	*i*	*v*
Class 4	.16	.71	—.31	.47	.66	.12
Class 5	.58	.61	.24	.52	.59	.17

The high correlations between A. D. and *i* and the low correlations between A. D. and *v*, show that the A. D. is not a measure of variability in the limited sense in which the term here is used. The A. D. is far more a measure of improvability than of variability.

A complete table of the correlation coefficients between the various measures and the Mean is given below.

TABLE 5

	Coefficients	B. A.		F. A.	
		Mean	A. D.	Mean	A. D.
Class 4	A. D.	.63	...	.50	...
	i	.48	.71	.38	.66
	vi	[.03]	.16	[.07]	.47
	v	—.24	—.31	—.11	.12
Class 5	A.D.	.40	...	.59	...
	i	.33	.61	.74	.59
	vi	.23	.58	.43	.52
	v	[.04]	.24	[.00]	.17

The Relation Between Variability and Improvability. The fact that the *vi* value correlates less highly with the mean value than does the *i* value, suggests that the variability factor in the *vi* coefficient acts in opposition to the improvability factor. This view is well substantiated by the correlation coefficients between the *i* values and the *v* values. Generally speaking, it would appear that the greater a subject's improvability the less would be his variability.

TABLE 6

	Correlations between *i* and *v*	
	B. A.	F. A.
Class 4	—.35	—.61
Class 5	—.24	—.28

Conclusions

1. The A. D. of a series of performances by the same individual, is not a measure of variability but rather one of improvability.

2. A relation of a positive nature exists between ability and improvability.

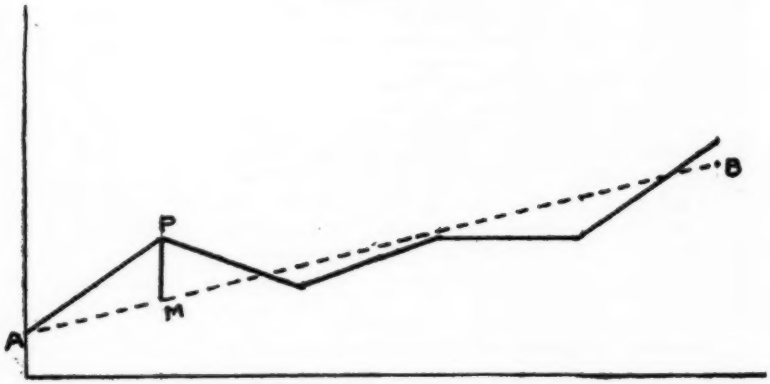
3. No such relation exists between ability and variability (v values) of performance in the two tests used.

4. The relation between variability and improvability is of a negative nature; that is, so far as these two groups of subjects and these two tests are concerned.

Appendix

An objection to the measures of variability suggested in this paper, is that they do not fall into line with those used in statistical work. To meet this objection Dr. W. Brown has made out a formula "to determine the true value of the

Diagram III



M. V. of a series of performances of a single individual, when the performances show a progressive improvement."

Let AB be the best fitting straight line, its equation being $g = mx + c$. Then the true M. V. will be the average of all such distances as P. M., taken without regard to sign.

Put PN = Y, MN = y = mx + C

Using the method of best squares we get as the best fitting line,

$$y = \frac{12S(Yx) - 6(x+1)S(Y)}{x(x^2-1)} \cdot x_x + \frac{(4x+2)S(Y) - 6S(Yx)}{x(x-1)}$$

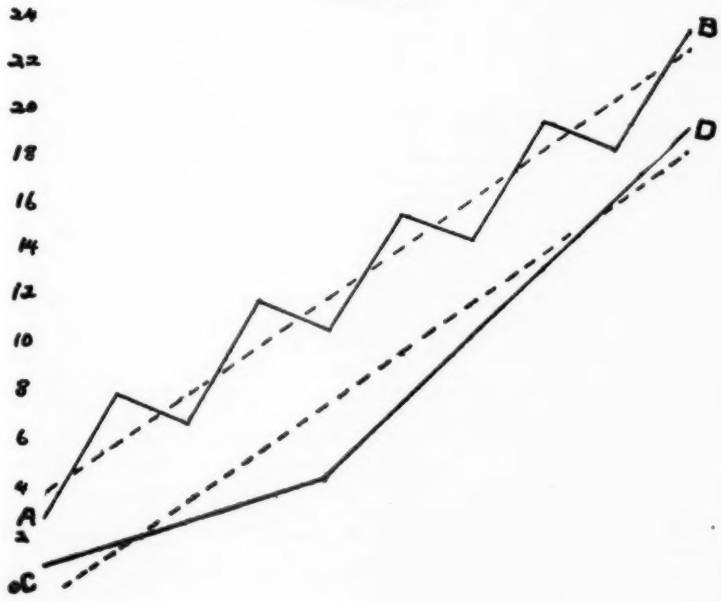
where x_x is the current coordinate.

The values of the successive ordinates of this line are determined by substitution; then the average of the differences between these ordinates and the corresponding ones of the curve (taken as all positive) will be the true value of the M. V.

Dr. Brown's "true M. V." is however a measure of the change of *the rate of improvement,* as well as of variability between consecutive performances (considered apart from improvement).

The two imaginary cases given below show this difference. The Curve CD shows change in the rate of improvement. The curve AB shows variability between consecutive performances.

DIAGRAM IV



The performances represented by the line AB give a "true M. V." of 1.3 and $v = .8$. From the curve CD the "true M. V." works out to 1.3 and $v = 0$.

In the case of the line AB the "true M. V." measure the variability between consecutive performances only. The "true M. V." of the curve CD is a measure of the change in the rate of improvement.

The "true M. V." of each of the 45 subjects for the B. A. test (Class 5) was calculated and the results were correlated with the other measures with the following results:

CORRELATION COEFFICIENTS BETWEEN "TRUE M. V." AND:—

v	*i*	*vi*	Mean	A. D.
.48	.37	.74	.34	.58

THE CAUSAL RELATIONS BETWEEN STRUCTURE AND FUNCTION IN BIOLOGY

By E. Stanley Abbot, McLean Hospital, Waverley, Mass.

In a not very wide search through the possible literature the writer has been unable to find a solution of the problem indicated by the title of this paper. That he is not the only one to whom it has been more or less of a puzzle is evident from some comparatively recent discussions in medical and other societies. In one it was said "The question of the relation of structure to function is the great biologic problem," the speaker stating that "function determines structure just as in its turn structure determines, delimits—that is, places definite limits on function," [1] but without further elucidating the relationship.

Does structure determine function, or does function determine structure, or does each determine the other, and if the latter, how can it be?

The answers to these questions seem to the writer to be matters partly of definition, partly of point of view, and partly of the recognition of purpose in Nature.

In the inorganic world structure may be regarded merely as the mechanical collocation of parts in a whole. The pile of sand has structure in this sense. But in the biologic world, and in all structures made or used by man, structure is a mechanical collocation of parts *adapted to an end.* Structure then becomes a machine, an organ, a mechanism as a means to an end. Though there are some who still try to explain all vital (including psychic) phenomena on a basis of mere mechanical cause and effect, and think they succeed, the majority hold with Kant that efficient causes alone are not sufficient to explain the facts of organic life, and that final causes are essential to the explanation and that they belong to a different series.

In the so-called exact sciences—mathematics, chemistry, physics, astronomy—the question of end and means does not arise; or if, as in applied physics, it does arise, it takes the

[1] Dr. W. Ophüls, Anatomic Structure and Function, *Jour. A. M. A.*, Vol. 63, p. 521.

form of man's devising means to attain his own definite conscious ends or purposes.

But in the biological sciences it is not so obvious who conceives the end that is to be served. Personally the writer feels forced to the conclusion that all Nature—the universe as a whole—is a personality whose total end is the perfection of all its parts; that to this end the development in each evolving part, or biological unit, of mechanisms which enable this part to adapt itself better and better to its environment is an essential means; and therefore that it is Nature itself—the universal personality—which has conceived the ends which are served by biological mechanisms, whether physical, psychical or ethical.

Not only universal ends but also those of the biological unit are served by these mechanisms. But it was not the individual unit that conceived the ends to which its structure is adapted. Having the structure, however, the individual may use it for its own conscious ends, where evolution has advanced far enough for it to formulate them. So rarely in biology do we see structures that are not adapted to ends, that when we happen upon a new structure we inevitably ask what its purpose may be. As a matter of course we assume that it serves *some* purpose. Hence we are justified in defining structure in biology as *a mechanical collocation of parts adapted to an end.*

In the biological sciences the word *function* is used in connection with the *activity* of some structure or mechanism; and, since structure or mechanism involves an end, function has to do with *activity directed to an end.* This expresses an actual or potential relation between two terms, a something which acts or is capable of acting, and a something which is done or is to be done. This relation may be regarded from the point of view of one term or of the other—actively from the point of view of the doer, i. e., structure, *agens,* or passively from that of the thing to be done, *agendum.*

When, for example, we say "it is the function of the stomach to digest food," we use the word from the point of view of the stomach as agent, *agens.* In this case function means *activity directed to an end,* and it expresses the relation between the terms—the doer and the end.

But when we say "food is to be digested, and that is the function of the stomach," we use the word from the point of view of the thing to be done, *agendum.* In this case function

means *an end toward which an activity is directed*, and it therefore expresses but one term of the relation.[2]

In many instances it is immaterial which meaning of function we have in mind—the context makes us automatically choose the appropriate one. But when the two meanings are brought into contrast, with only the one word to use for the two meanings, as in considering the causal relationships between structure and function, confusion inevitably arises, unless we keep clearly in mind that there *are* two meanings. With this difference in mind we can approach the problem of whether structure determines function, or vice versa, or if both are true.

Structure being a mechanical collocation of parts adapted to an end, it is obvious that it cannot act, i. e., serve that end, unless it already exists. The stomach must exist before it can digest food, i. e., perform its function in the sense of activity directed to an end. The structure of the stomach, whether a mere body cavity as in the "gastrula" or the highly complex organ of some of the higher animals, will determine the way in which food is digested. That is, in the actual performance of its function, the structure of the organ will determine how the thing is done. *Mechanically,* therefore, that is, in the cause-and-effect series, ***structure*** precedes, or ***determines,*** or is a cause of ***function.***

But on the other hand, it is the end toward which an activity is to be directed (*agendum*) that will determine what sort of a mechanism is required. If a tree is to be felled, we do not attack it with a pencil, but with something—axe or saw—that will tear or cut its tissues. It is the nature of the food stuffs to be digested that determines the character of the organs and processes necessary to digest them. If our food had been iron, and oxidation necessary for its use, the structure of our stomachs would have been of such a character as to oxidize iron. In other words, in the development of organs, structure, or mechanism, for the performance of certain functions, the nature of the thing to be done, i. e., the function in the sense of end to which an activity is directed, will determine to some extent the structure. *Teleologically,* therefore, that is, in the end-and-means series, ***function*** precedes, or ***determines,*** or is a cause of ***structure.***

When Spencer says "Everywhere structures in great measure determine functions; and everywhere functions are in-

[2] For the needs of the present argument it is not necessary to subdivide the ends as Ruckmich does (*Am. Jour. Psychol.,* Vol. 24, p. 99 sq.).

cessantly modifying structures," [3] he states a seeming paradox which is easily soluble if we paraphrase it, in accordance with the above distinction, "Everywhere mechanical collocations of parts adapted to ends in great measure [mechanically] determine the activities directed to [those] ends; and everywhere ends toward which activities are directed are incessantly [teleologically] modifying the mechanical collocations of parts adapted to [those] ends."

Thus it is seen that each proposition is true, but in a different sense. It is only teleologically that function determines structure, and only mechanically that structure determines function. In neither case is function or structure the *sole* cause of the other. And in no case can either structure or function or the relations between them be wholly understood on mechanical or on teleological grounds alone.

The value of a principle lies in its application. The application of the principle involved in the foregoing discussion has been of fundamental value to the writer (and hence it may be to others) in approaching the problem of mind, the subject-matter of psychology which he regards as one of the biological sciences—biology being conceived as the science of living things rather than as the science of matter in the living state.

So far as our experience goes mind is manifested only by living things, and by them as internal activities or reactions of individuals. These reactions are made in the course and for the purpose of the self-adaptation of the individual to his environment. The nature of the environment then will partly determine, as final cause, what kinds of activities the individual shall be capable of, i. e., what general types of reaction he must make, and hence the structures and mechanisms for making them.

This is obvious when we regard such reactions as those of seeing, hearing, etc. The physical nature of light and color as a mode of energy has determined, as final cause, the general nature of the organ which shall be sensitive to or stimulated into activity by it. Equally obviously the actual structure of the organ sensitive to light in any given biological unit, whether the red spot of the star fish or the eye of man with its nervous connections, will determine, as an efficient cause, the extent and completeness of the reaction made by that unit. Since every individual is finite, no reaction can be absolutely complete.

[3] Principles of Biology, Vol. II, p. 4.

It is less obvious, though in the writer's belief not less true, that there are in the environment not only things, but *kinds* of things, the actual kind consisting of *all* the past and present individuals of the kind—all the specimens of the species. The existence of kinds as actual objective realities or factors in the environment is a determinant, as final cause, of the capacity of the individual to form *concepts*, and hence of the structure which subserves this function. The mechanism of this function is still obscure; the structure or organ is doubtless some part or parts of the brain. Since no individual can experience all the specimens of any given kind of thing, the concept which he forms will be in part determined, as efficient cause, by the number and variety of the specimens that he has experienced, and in part by the extent of his capacity to react in this particular way; this capacity being in turn efficiently determined by the structure of the brain. Our concept of any particular kind of thing or event grows or is modified by additional experiences of things or events of that kind, up to the point of our capacity to enlarge or modify our concepts. The feeble-minded person has very limited capacity, the scientific genius very great capacity, in this respect.

Similarly, in the writer's belief, it is equally true that there are *relations*, not only spatial and temporal, but of many other kinds; and that there are many types or kinds of *law* or *necessity;* and many kinds of *obligation* or *duty;* and that because these are all actual objective realities existent in the environment, they have been final causes of the development of mechanisms and structures for the purpose of enabling the individual to adjust himself to them as factors of the environment.

There is very greatly needed, for psychology especially, a study of the environment, not only as a particular efficient cause for individual reactions of given types in given situations and circumstances, but as a general or final cause for the evolution in the individual of the capacities to react in all the ways in which it does react and of the mechanisms and structures for this purpose. For example, for us human beings obligation is a very important factor in our environment, in consequence of which a capacity for forming moral concepts has been evolved in us. What types of obligation are there? To which of them does this or that person react, or can he react? Can or do any of the lower animals react to them, and if so, to which? Have any mechanisms been evolved in them for this purpose?

If we would fully understand comparative psychology and

animal behavior, we must know what factors of the environment the animal is capable of reacting to, and what the *whole* situation is to which it is reacting, as well as the reaction itself in any given experiment or observation. The same is true of human psychology and behavior. In the study of pathological psychology the factors which affect the structures that subserve these functions and modify their mechanisms must of course also be considered; in normal psychology they may be largely taken for granted. It may be added that a comprehensive study of the nature of the environment—an ontology—must of necessity lie at the foundation of a thoroughly scientific theory of knowledge, and becomes essential if we would fully understand some of the differences between knowledge on the one hand and ignorance, error, delusion and hallucination on the other.

A NOTE ON COLOR PREFERENCE

By M. Luckiesh, Cleveland, Ohio

During the course of investigations in color science some data relating to color preference were obtained which will be recorded briefly. The Wundt (E. Zimmerman) colored papers were used but as there was no saturated green paper such a one was dyed and placed in the series. This color is designated as q, the other letters in the illustrations indicating the catalogue designations of the various colored papers. Fifteen colored papers each four inches square were spread out haphazardly upon a white surface, the individual colors being from six to ten inches apart. The observer was instructed to isolate the colors from everything as far as possible and to choose them in their order of preference for 'color's sake' alone. As the colors were chosen they were laid aside. One of the objects of the investigation was to ascertain if there was an appreciable difference in the order of preference when the colors were chosen under ordinary artificial (tungsten) light, T, and under daylight, D. (It is well known that the spectral character of an illuminant greatly influences the appearance of a colored object both as to hue and relative brightness.) The experiments were therefore carried out under the light from incandescent tungsten lamps operating at 7.9 lumens per watt and also under daylight from the blue sky as it entered a large window. In both cases the intensity of illumination was sufficiently high for examining colors with ease.

Fifteen observers were used for both sets of observations, the personnel being the same in both series. The time elapsing between the two tests for individual observers varied from one to four weeks. The colors were ranked from one to fifteen and the mean ranks for the individual colors (obtained by averaging the individual ranks of the fifteen observers) are plotted in Fig. 1. There may be some question regarding the legitimacy of this definition of color preference but the procedure adopted here appears to be satisfactory in this case and certainly provides a simple method for plotting the data. It is to be regretted that more observers were not

available but the data appears to lead to fairly definite conclusions. Lemon-yellow was placed last or next to last by a large majority of subjects as is evident by the fact that its mean rank is just above fourteen for both series. As seen in Fig. 1, deep blue ranked highest in the mean preference order although red-purple and three of the reds also ranked high.

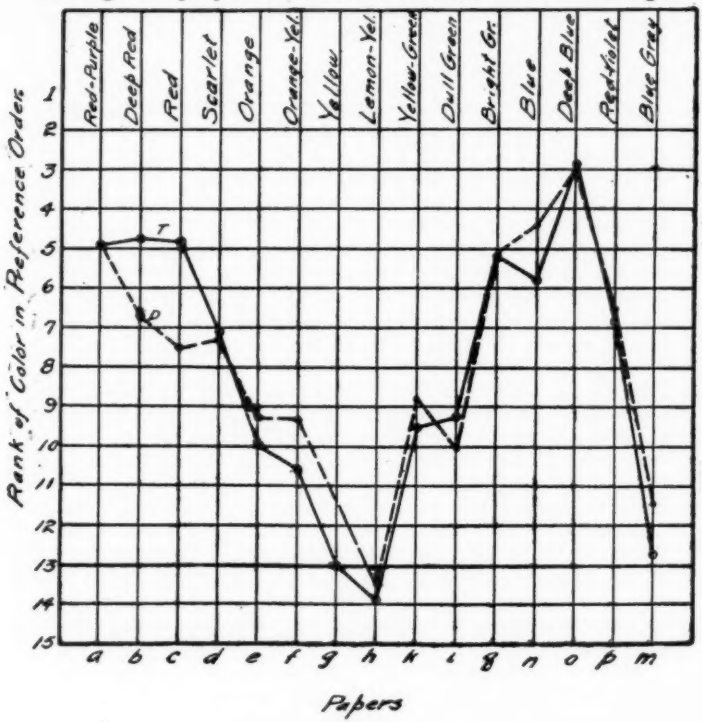


Figure 1

It is not surprising to find the reds ranking higher under the artificial illuminant (solid line) than under daylight (dashed line) although there appears to be little difference in the positions of the remaining colors in the two orders of preference. The latter may be accounted for possibly by the fact that the colors were quite saturated with the exception, *m*, on the extreme right, namely blue-gray. This color ranked quite low.

The colors have been arranged in the spectral order of their dominant hues as far as possible. In general the colors whose dominant hue lie near the ends of the spectrum are highest in the preference order. Such a result is consistent with conclusions drawn from other observations.

In Fig. 2 are plotted the mean deviations from the mean for each test color. A considerable variation is expected in such work and only when this variation is not too great is it

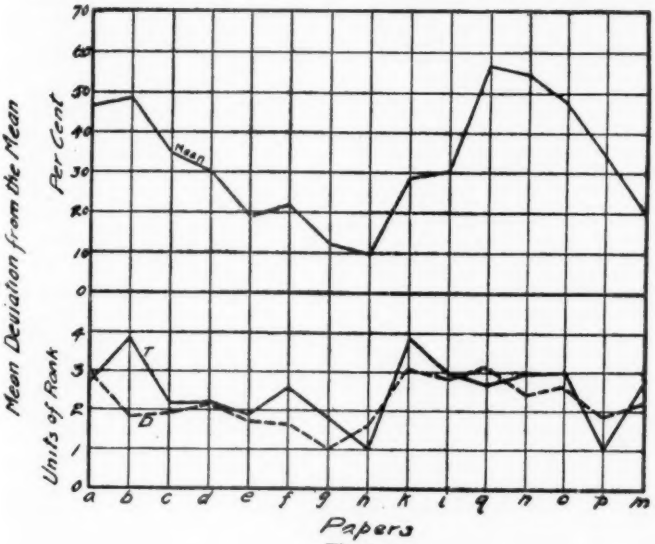


Figure 2

advisable to draw definite conclusions. At the lower part of Fig. 2 the mean deviations are given in terms of units of rank—there being 15 test colors and therefore 15 units of rank. A fair average mean deviation is somewhat more than two units of rank. The variations do not appear to be sufficient to endanger the conclusions drawn. In the upper part of Fig. 2 the mean deviations are expressed in per cent. Where the rank is high obviously the per cent. deviation is higher owing to the fact that the actual mean deviations as expressed in units of rank are approximately constant.

In Fig. 3 are plotted the reflection coefficients of the fifteen test colors for the two illuminants used. These of course

represent also their relative brightnesses as viewed under illuminations of equal and uniform intensity from the two illuminants. It is seen that the preference of a given saturated color is lower as the relative brightness of the color is higher. In Fig. 3 are also plotted the ratios of the brightness of each

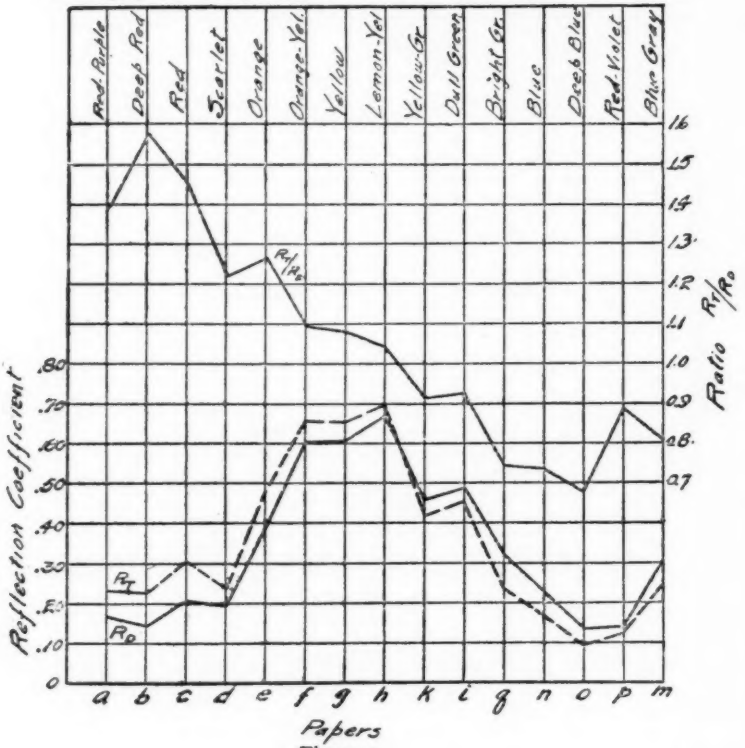


Figure 3

color under the artificial light to that under the daylight. Owing to the variation of daylight in spectral character and intensity it is advantageous to use "artificial daylight." This the writer[1] has found very convenient for investigations in color.

[1] M. Luckiesh, Artificial Daylight, *Electrical World*, Sept. 19, 1914. M. Luckiesh and F. E. Cady, *Trans. I. E. S.*, No. 8, 1914, p. 839.

According to E. B. Titchener there are two types of observers; one type prefers the saturated colors and the other definitely prefers unsaturated or 'artistic' colors but the former type constitutes a majority. It appears to the writer from these and other observations that, when colors are chosen for 'color's sake' alone, the saturated colors are almost invariably chosen. E. J. G. Bradford [2] in experimenting with twenty-six students with a set of fifteen papers, each about thirty inches square, found that saturated colors were most preferred. He also found that the admixture of a small proportion of another color lowered the position of the color in the preference order. Cohn [3] has also contended that increase of saturation raised the position of a color in the preference order. Bradford found that the order of preference remained reasonably constant by performing the same experiments on three observers after an interval of two weeks and again after a lapse of twelve months.

It appears safe to conclude that, in a group of rather highly saturated colors, those, whose dominant hues lie near the ends of the visible spectrum, whose brightnesses are relatively low and whose saturations are relatively high (low per cent. white) are found to rank relatively high in the order of preference. Apparently the reds rank higher under incandescent tungsten light than under daylight. Not a sufficient number of colors of various tints and shades were used to draw further conclusions regarding the influence of the illuminant upon the preference order, however such an influence exists to an appreciable degree as is evident from daily experience.

[2] On the Relation and Aesthetic Value of the Perceptive Types in Color Appreciation. *Amer. Jour. of Psych.*, 1913, 24, p. 545.

[3] Gefühlston and Sättingung der Farben. *Phil. Stud.*, 1900, 15, p. 279.

INITIAL SPURT IN A SIMPLE MENTAL FUNCTION

By J. Crosby Chapman and Willis J. Nolan, Western Reserve University

In a recent article[1] on initial spurt one of the writers intimated that this subject was being further investigated using shorter intervals of time. This paper records the result of that investigation. As was pointed out in the paper, to which reference has been made, the weakness of previous experiments on initial spurt has been the use of successive intervals of time of too long duration to reveal the rapid decline in efficiency which takes place. Consequently the effect of the spurt has been so neutralized as to escape attention. The former study in which two-minute intervals were used showed undeniable signs of initial spurt, but it appeared that the effect would have been more evident if shorter intervals had been employed. For this reason, in the present study it was thought advisable to resort to intervals of thirty seconds. This interval was judged the minimum which would not interfere with the freedom of the subjects in their work.

The general method of the experiment was similar to that already described. The subjects were tested in continuous addition for sixteen minutes on seven successive occasions. The addition blanks consisted of forty-eight columns of ten one-place numbers, and were similar to those used by Thorndike[2] and other experimenters. Five different sheets in all were employed so as to eliminate any memory effect. The experiment was conducted as follows. The sheets were supplied to the subjects face down. At the word, "Commence," the subjects reversed these sheets, and commenced to add down the columns. At each thirty-second interval the word, "Check," was called at which time the subject made a small tick on the right-hand side of the column on which work was being done. This mark indicated the exact place in the column which the subject had reached. The checking very soon became automatic, and was practiced before the data of the research were collected.

[1] Chapman, *Jour. Educ. Psych.*, Vol. 6, Sep. 1915.
[2] Thorndike, *Amer. Jour. Psych.*, Vol. 21, 1910, p. 483.

Obviously in an investigation of this kind great care has to be taken that the subjects do not add in advance of the experiment. This was eliminated not only by keeping the sheets reversed before the experiment started but also by announcing the number of the column on which to commence work just previous to the starting signal. The subjects were not informed that the results would be used to investigate the problem of initial spurt. The tests were administered a week apart to twenty individuals who took the tests on the average seven times. The subjects were girls of an average age of seventeen, attending a private school in Cleveland. Each week the results of the previous tests were announced with the object of maintaining interest.

The basis of scoring was to allow ten for each column correctly added, since there are ten additions in each problem. No allowance was made for the time spent in writing the sum at the base. For each column in which an error was made ten was deducted. This possibly inflicted too high a penalty for errors, as in a normal case not more than one or two errors would be made in the same column. It seemed desirable however to inflict this penalty as it presents the only perfectly safe scoring basis. In this way it is possible, counting

TABLE I

AGGREGATE SCORES DURING EACH SUCCESSIVE HALF-MINUTE PERIOD
Fifteen minutes' continuous work on each day (Periods 1-30)
Twenty subjects tested on seven days

Half-minute period	Total uncorrected score	Total errors	Total corrected score	Half-minute period	Total uncorrected score	Total errors	Total corrected score
1	2858	582	2276	16	2176	453	1723
2	2511	476	2034	17	2234	404	1830
3	2363	575	1788	18	2125	389	1756
4	2251	437	1814	19	2262	413	1849
5	2274	446	1828	20	2152	543	1609
6	2254	337	1917	21	2247	463	1784
7	2315	419	1896	22	2195	443	1752
8	2192	440	1752	23	2242	488	1754
9	2349	462	1887	24	2232	384	1848
10	2221	511	1710	25	2298	478	1820
11	2258	417	1841	26	2290	504	1786
12	2183	498	1685	27	2185	452	1733
13	2140	418	1722	28	2236	438	1798
14	2141	436	1715	29	2294	484	1810
15	2174	414	1760	30	2188	406	1782

each separate addition as a unit, to determine the exact amount of work done during each successive half-minute period.

The aggregate scores of all the individuals tested on the seven occasions in each successive half-minute period are shown in Table I. It will be seen that only thirty half-minute periods are recorded in order to eliminate any possible so-called end-spurt effects. The number of errors during each of these successive half-minutes is also recorded from which the corrected aggregate scores of each of the half-minute periods were obtained.

From Table I it will be seen that both the uncorrected and the corrected scores show a considerable initial spurt. This is markedly true in the case of the first period, but even in the second period it is still apparent; the efficiency during the second period never being equalled during any later period. In Table II the uncorrected and corrected scores of each successive half-minute are reduced to a percentage basis, in each case the product of the first half-minute being arbitrarily chosen as 100%.

TABLE II

SCORES REDUCED TO PERCENTAGE BASIS
(Score during first period = 100)

Half-minute period	Uncorrected score	Corrected score	Half-minute period	Uncorrected score	Corrected score
1	100	100	16	76	76
2	88	89	17	78	81
3	83	79	18	74	77
4	83	80	19	79	82
5	79	81	20	75	71
6	79	85	21	78	78
7	79	84	22	77	77
8	81	77	23	78	77
9	77	83	24	78	82
10	82	75	25	80	80
11	78	81	26	80	79
12	79	74	27	77	76
13	76	76	28	78	79
14	75	77	29	80	80
15	76	77	30	76	78

Table II only serves to bring out more clearly the facts recorded in Table I. A graphic representation of Table II is shown in Figure I.

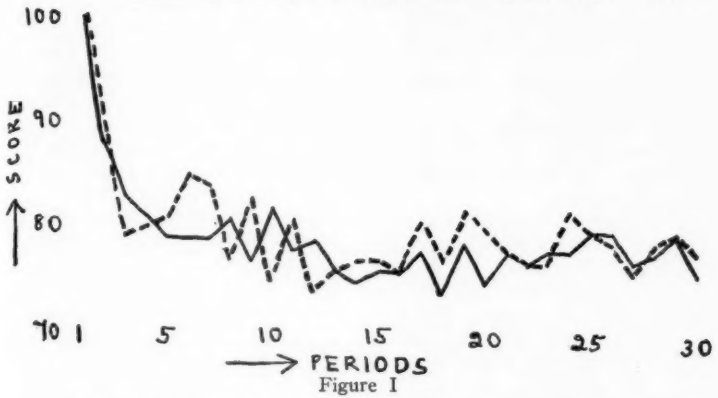


Figure I

In this figure the uncorrected score is represented by the continuous line, and the corrected score by the broken line. It will be seen that there is a large decline in efficiency in the curves representing both the corrected and uncorrected scores.

Perhaps the most advantageous method of presenting the results of this experiment is to compare the score during each early half-minute period with the average score of the last twenty half-minute periods. This has been done in Table III which shows the percentage amount by which each of the first ten half-minute periods exceeds the average of the last twenty half-minute periods in the case of both the corrected and uncorrected scores.

TABLE III

Average scores (periods 11-30) is exceeded by score during period shown below by percentage recorded in Columns I and II	Column I Uncorrected score	Column II Corrected score
	Percentages	Percentages
1	28.8	28.8
2	13.1	14.7
3	6.3	1.1
4	6.3	2.3
5	1.4	3.4
6	2.3	8.5
7	1.4	7.3
8	4.5	—1.1
9	—1.4	6.8
10	5.9	—3.4

From this table we find that 28.8% more work is done during the first interval than during the average of the last twenty intervals. Considering the second interval in the case of the corrected score there is 14.7% more efficiency, and the corresponding figure for the uncorrected score is 13.1%. Even leaving the first interval out of consideration the efficiency during the second period would establish a claim for initial spurt.

When this conclusion is considered in the light of the results which have been obtained on the decrease of mental efficiency due to fatigue,[3] which indicate that in a mental function of this kind not more than a 10% decrease may be expected as a result of twelve hours' continuous work, some idea can be obtained of the decline in efficiency which is represented by a fall of 28.8% in product produced.

An examination of the corrected scores of the twenty individuals taking part in the test is instructive. In the case of 80% of the subjects the total scores of the periods 1-5 exceeded the scores of the period 26-30. A comparison of the totals of the periods 1-3 with the totals of the periods 11-13 shows that 90% of the individuals were more efficient during the first three periods.

Although the errors during the first period are greater than during any successive period, arithmetical analysis shows that there is no method of penalizing the errors so as to reduce initial spurt to zero in the corrected score.

In view of the fact that the use of shorter intervals has revealed a more pronounced initial spurt effect, it does not seem possible to deny the presence of this factor. The subject when set to mental work of this type, owing probably to absence of interference, commences at a speed which is greater than he can maintain. He very rapidly settles down to a normal rate at which he can work for long periods. It is the rapidity of this decrease in efficiency which has led to the fact that initial spurt has been overlooked and even denied.

Our best thanks are due to the authorities of the Laurel School, Cleveland, for their courtesy in allowing facilities for this work, and also to Miss M. E. Hills for her assistance in conducting the class experiment.

[3] Hollingworth, *Psych. Review*, Vol. 21, No. 6, p. 473, Nov. 1914.

THE EFFECTS OF PRACTICE IN ITS INITIAL STAGES IN LIFTED WEIGHT EXPERIMENTS AND ITS BEARING UPON ANTHROPOMETRIC MEASUREMENTS

By SAMUEL W. FERNBERGER, Clark University

In an earlier study[1] we found, by treating our results by the coefficient of divergence, that there was some factor which changed during the experimentation. A further statistical treatment, as well as the fact that the influence of this factor was greater upon a subject who was untrained at the beginning of experimentation than upon a trained one, led us to believe that this influence was due to the effect of the progressive practice which the subject obtained during the experimentation. We also found that the influence was greater at the beginning of the experiment.

Urban[2] takes up this problem by a consideration of his earlier results in lifted weight experiments, as well as a consideration of my results. Urban calculates the results which were taken according to the procedure of the method of constant stimuli in groups of 50 judgments upon each comparison pair. He studies the effect of this progressive practice upon the coefficients of precision (the h's of the psychometric functions), upon both the upper and lower thresholds, and upon the values of the interval of uncertainty and the point of subjective equality. He finds that the values of the h's for both the greater and the less judgments tend to increase. This increase is, in the early stages of practice, at first very rapid, and then proceeds relatively more slowly. The size of the interval of uncertainty tends to grow smaller under the influence of progressive practice. This is due to the fact that the thresholds, the values which limit this interval, tend more nearly to approach one another. The influence is not evenly exerted upon the two thresholds, however. The

[1] S. W. Fernberger, On the Relation of the Methods of Just Perceptible Differences and Constant Stimuli, *Psychol. Monog.*, XIV, No. 4 (Whole No. 61), 1913, 19-46.

[2] F. M. Urban, Der Einfluss der Uebung bei Gewichtsversuchen, *Arch. f. d. ges. Psychol.*, XXIX, 1913, 271-311.

threshold in the direction of decrease remains relatively constant; the threshold in the direction of increase, on the other hand, tends to become smaller. Inasmuch as this change of the size of the threshold values is greatest for the upper threshold, there is also a change in the size of the point of subjective equality. This value tends to become smaller during the later stages of progressive practice. Urban also points out that the rate of change corresponds rather closely to the law of mass-action in chemistry. Hence the rate of improvement due to the practice obtained during a given interval is dependent not only upon the work performed during that interval but also upon the state of practice of the individual at the beginning of the interval.

Urban studied, therefore, the effect of progressive practice in lifted weight experiments during an extended series of judgments. We believed that it was of advantage to obtain a clearer picture of the improvement during the initial stages of progressive practice.

Our materials and methods were similar to those employed by Urban. Small brass cylinders were used as stimuli, which were arranged in pairs. Five such pairs were employed, each consisting of a standard stimulus of 100 grams and a comparison stimulus of 88, 92, 96, 100 or 104 grams. These stimuli were placed about the circumference of a table with a revolving top so that the stimuli could be brought successively directly under the hand of the subject. Thus the space errors were eliminated. The time errors were present in the first order, *i. e.*, the standard stimulus was always lifted first. The rate of lifting was regulated by the beats of a metronome so that the time-error remained constant. Immediately after the lifting of each comparison weight a judgment was given verbally in terms of the second weight, the subject employing the three categories of lighter, equal and heavier, which were defined in the usual manner. The observed relative frequencies of the different categories upon each of our comparison pairs thus obtained were treated in accordance with the methods of calculation developed by Urban.[3]

With these materials and with this manner of presentation, we obtained 100 judgments upon each of the 5 comparison

[3] For a more detailed description of the stimuli, the method of lifting and the treatment of results, *cf.* Fernberger, *ibid*, 6-11; S. W. Fernberger, On the Elimination of the Two Extreme Intensities of the Comparison Stimuli in the Method of Constant Stimuli, *Psychol. Rev.*, XXI, 1914, 337-340; F. M. Urban, Hilfstabellen für die Konstanzmethode, *Arch. f. d. ges. Psychol.*, XXIV, 1912, 236-243.

pairs from each of ten naive subjects.[4] The experiments were divided into two sessions of one hour each. At the beginning of the first session we explained the manner of lifting and then gave the subject practice in making the hand-movements in time to the metronome and in grasping and lifting a single weight. Not until these hand-movements had become reasonably regular did we begin our series; and all of the judgments given after the first round or two of the table were recorded. After this preliminary instruction and practice in the hand-movements, we succeeded in obtaining 50 judgments on each of our comparison pairs from the subject during the first session. At a later session, after an interval of at least twenty-four hours, we obtained 50 more judgments from the subject upon each of our comparison pairs. Frequent rest-periods were introduced in order to eliminate the fatigue factor.

For purposes of comparison, we have divided these hundred judgments on each pair into four groups of 25 judgments each in the order in which they were taken. Hence Series 1 comprises the values of the first 25 judgments on each comparison pair; Series 2 the second 25; Series 3 the third 25; and Series 4 the fourth 25 judgments. The time of experimentation was relatively short, but the calculations involved were rather long and involved the calculation, in all, of 120 different threshold values.

The results of these calculations for the different subjects are found in Tables I-X, each table being given to the results obtained from a single subject. Table XI gives the averages of the results of all ten subjects. All of the tables show a similar arrangement. The first column contains the numbers of the series, *i. e.*, the groups of 25 judgments upon each comparison stimulus in the order in which they were taken. The second and third columns contain the values of h_1 and h_2, the coefficients of precision of the curves of the psychometric functions for the lighter and heavier judgments respectively. The next two columns labelled D and I give the values of the lower and upper thresholds respectively. The next column gives the value of the interval of uncertainty $(I\text{-}D)$. It will

[4] My thanks are due to the following, who kindly consented to act as subjects in this investigation: Misses E. Gough and M. L. Grimes, both Assistants in Psychology at Wellesley College; Mr. F. J. O'Brien, Assistant in Experimental Psychology at Clark University; Misses E. Bowman and F. Mateer; and Messrs. H. R. Crosland, B. Hori, H. H. Long, R. B. Teachout, and R. H. Wheeler, all advanced students in psychology at Clark University. My thanks are also due to Professor J. W. Baird for his many helpful suggestions and for revision of the manuscript.

be remembered that one-half of this interval is the Threshold of Volkmann, which is recognized as the measure of sensitivity of the subject. Finally, the last column contains the values of the point of subjective equality. In each row will be found the values obtained from a treatment of the relative frequencies of the series indicated in the first column.

TABLE I

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.09796	0.12864	94.75	98.14	3.39	96.44
2	0.07414	0.07522	95.96	98.02	2.06	96.99
3	0.10454	0.09420	93.13	97.70	4.57	95.42
4	0.12952	0.13644	92.74	95.63	2.89	94.18

TABLE II

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.10777	0.10272	90.62	98.33	7.71	94.48
2	0.09352	0.12143	92.90	97.27	4.37	95.08
3	0.09582	0.11228	91.53	98.44	6.91	94.98
4	0.11875	0.10686	92.56	98.05	5.49	95.30

TABLE III

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.07063	0.08034	92.81	99.10	6.29	95.96
2	0.09471	0.07772	94.93	99.86	4.93	97.40
3	0.08161	0.09972	93.74	97.62	3.88	95.68
4	0.10392	0.09989	94.67	98.41	3.74	96.54

TABLE IV

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.12776	0.13971	96.86	99.79	2.93	98.32
2	0.12348	0.15051	98.64	100.69	2.05	99.66
3	0.14540	0.12635	96.30	99.10	2.80	97.70
4	0.12479	0.13280	96.22	98.16	1.94	97.19

TABLE V

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.04786	0.08470	90.37	102.18	11.81	96.28
2	0.10187	0.11359	91.02	99.62	8.60	95.32
3	0.12352	0.12159	91.90	100.30	8.40	96.10
4	0.11625	0.09344	91.62	100.96	9.34	96.29

TABLE VI

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.12524	0.11658	93.64	96.26	2.62	94.95
2	0.10684	0.12601	93.18	96.64	3.46	94.91
3	0.15475	0.10886	92.41	96.31	3.90	94.36
4	0.14100	0.11280	93.32	95.66	2.34	94.49

TABLE VII

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.07108	0.07576	91.93	99.16	7.23	95.54
2	0.07554	0.09222	92.17	97.37	5.20	94.77
3	0.08500	0.08015	92.13	98.98	6.85	95.56
4	0.09400	0.08321	92.17	98.26	6.09	95.22

TABLE VIII

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.09365	0.11546	92.69	105.56	12.87	99.12
2	0.13934	0.09797	90.85	104.55	13.70	97.70
3	0.11675	0.12700	90.86	102.52	11.66	96.69
4	0.08441	0.10144	90.67	101.99	11.32	96.33

TABLE IX

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.09038	0.08279	88.13	100.43	12.32	94.29
2	0.06068	0.12156	90.84	98.76	7.92	94.80
3	0.07990	0.09621	91.71	99.01	7.30	95.36
4	0.11394	0.14412	92.76	98.48	5.72	95.62

TABLE X

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.05983	0.07900	93.22	105.08	11.86	99.15
2	0.10953	0.09884	94.49	101.79	7.30	98.14
3	0.11907	0.09212	94.36	101.67	7.31	98.02
4	0.12128	0.08246	93.83	99.99	3.08	96.91

TABLE XI

Series	h_1	h_2	*D*	*I*	*Interval of uncertainty*	*Point of subjective equality*
1	0.08922	0.10058	92.50	100.40	7.90	96.45
2	0.09796	0.10751	93.50	99.46	5.96	96.48
3	0.11064	0.10585	92.81	99.16	6.36	95.99
4	0.11479	0.10935	93.06	98.56	5.50	95.81

An examination of the values contained in Table XI indicates that the same tendencies are present for our series as were found by Urban, only these tendencies are even more marked. The values of h_1 (the coefficient of precision for the lighter judgments) show a steady rise and one which is more marked for the early series than for the later. The values of h_2 (the coefficient of precision of the heavier judgments) show a marked tendency to increase especially for the earlier series. The curve does not rise steadily, however, inasmuch as the value for the third series is slightly smaller than that for the second. The values of the threshold in the direction of decrease (D) remain fairly constant. They show variations of an unsystematic character such as one usually finds in lifted weight experiments, but no systematic tendency is evident. The values of the threshold in the direction of increase (I), on the other hand, show a marked tendency to decrease which again is most marked between the first and second series. The values of the interval of uncertainty show a marked tendency to decrease, particularly marked at first. This decrease is broken at one point; the value for the third series being slightly larger than that for the second series. The values for the point of subjective equality similarly show a tendency to decrease, but not so markedly as for some of the other values. This tendency is broken at one point; the value for the second series being very slightly larger than that for the first.

Our results, then, are precisely similar to those obtained by Urban, except that the tendencies indicated are here more marked. This we would expect, since we are dealing with the initial stages of progressive practice, while Urban was dealing with the effects of progressive practice for an extended series of experiments. In our results the course of the general tendencies to increase or decrease are broken in only three places; the value of h_2 for the third series, the value of the interval of uncertainty for the third series, and the value of the point of subjective equality for the second series. Regarding this last value we can only say that the effect of the initial practice is about equally strong upon both thresholds; that at the first the lower threshold tends to assume a slightly greater value to about the same extent that the value of the upper threshold is decreased. Hence as the two thresholds approach each other in approximately the same amount, the point of subjective equality remains practically unchanged.

The other two apparently anomalous values are more read-

ily explained, and indeed, strengthen our belief that progressive practice is the sole factor which is operating here. Progressive practice is essentially a form of learning process. In the case of any learning process there is always something of a loss, due to forgetting during a rest-period, so that in starting out after the rest the subject does not have as high a degree of efficiency as he had at the end of the work-period just before. It will be remembered that we obtained the first two groups of 25 judgments on each comparison pair during the first day's experimentation for each subject, and the last two groups during a second experimental period. Hence there was a rest-period of more than one day between the second and third groups. During this period some of the practice obtained during the first period, we may well believe, was lost, so that, for the third group the subjects started at a lower degree of efficiency than they had had at the ending of the second group. This, indeed, is reflected throughout the results and shows particularly in the two apparently anomalous values of the h_2 and the interval of uncertainty of the third series, which are slightly lower and higher, respectively, than the corresponding values of the second group.

Although we have this exceedingly great regularity of the different tendencies of increase and decrease for the different values under consideration for the averages of all ten subjects, still the values for the individual subjects do not show quite such great regularity. Nevertheless the values for every subject show more or less markedly the same general tendencies of increase and decrease of the different values. The values for one subject (Table X) show practically a regular increase and decrease in values with one exception; the values of the interval of uncertainty for the second and third groups are practically identical. One would not expect great regularity in the values of the individual subjects, because relative frequencies from 25 judgments on each comparison pair are far too small a number to be considered ideally as probabilities. Still we were forced to use such a small number for purposes of comparison if we wished to study the initial effects of progressive practice. We believe that much greater reliance is to be placed upon the averages for all of the subjects as in this case accidental variations would tend to cancel one another.

The fact that progressive practice in its initial stages has such a marked effect upon the position of the thresholds and upon the values of the interval of uncertainty and the point of subjective equality is of exceedingly great significance in

the application of the psychophysical methods for purposes of anthropometric measurements. Anthropometrists seek to determine the sensitivity of the subjects or the point of subjective equality with as few a number of judgments and in as short a time as possible. The method of constant stimuli recommends itself for such measurements inasmuch as it is by this method alone that the subject can be kept in entire ignorance of the objective relations of the stimuli. The calculations involved by the use of the method of constant stimuli are rather lengthy unless the results are taken in such a form that one may apply Urban's tables, referred to above. One of the conditions for the application of these tables is that the number of judgments obtained must be exactly divisible into 100. Hence we may employ the tables only in those cases where we have obtained either 10, 25, 50 or 100 judgments upon each comparison pair. In order to show the effect of this initial practice upon the number of determinations obtained, we have calculated the intervals of uncertainty and the points of subjective equality for each of our ten subjects for the first 25, the first 50, and the first 100 judgments on each of our comparison pairs. The first values obviously correspond to the first rows of Tables I-X. The second values are calculated from the observed relative frequencies of groups 1 and 2 of the former tables. The last values are calculated from the relative frequencies of all of the determinations made, namely, groups 1, 2, 3 and 4.

TABLE XII

Subjects	*Interval of uncertainty*			*Point of subjective equality*		
	25	50	100	25	50	100
A	3.39	2.84	3.50	96.44	96.31	95.61
B	7.71	6.66	6.35	94.48	94.81	95.02
C	6.29	5.57	4.76	95.96	96.70	96.35
D	2.93	2.27	2.48	98.32	98.86	98.35
E	11.81	9.60	9.04	96.28	96.02	96.19
F	2.62	2.69	3.12	94.95	95.10	94.76
G	7.23	6.08	6.47	95.54	95.17	94.70
H	12.87	13.81	12.96	99.12	98.40	97.20
I	12.32	10.19	8.31	94.29	94.60	95.18
J	11.86	9.23	7.87	99.15	98.62	98.02
Average	7.90	6.89	6.49	96.45	96.46	96.14

The values obtained from this calculation are given in Table XII. The first column contains the letters of the subjects. The next three columns contain the values of the interval of uncertainty,—the first of these, those for the first 25 judgments on each comparison pair, the next for the group of 50 judgments and the third for the group of 100 judgments. The next three columns show a similar arrangement as regards the groups and contain the values of the point of subjective equality. The last row of values in this table contains the averages for each column. If we consider the averages for the point of subjective equality, we find that the values for the group of 25 judgments is almost identical to that for the group of 50 judgments. Both vary slightly from the value for the entire group of 100 judgments. But the variations are so slight that we may consider them to be negligible and dismiss the point of subjective equality from our discussion.

A very different state of affairs is to be found when we compare the averages for all of our subjects of the intervals of uncertainty for the different groups. If we compare the group of 100 judgments with the group of the first 50 judgments, we find that the value for the latter is somewhat larger, the difference being just 0.4 grams. The difference between the values for the group of 100 judgments and the group of the first 25 judgments is considerably larger, being 1.41 grams, or over three and a half times as large as the difference between the values of the 100 and 50 judgment groups.

Now, in anthropometric measurements we have two ideals to which we must more or less closely conform—time and accuracy. We cannot actually conform to the ideal of accuracy because it was shown by our results and those of Urban that this factor of progressive practice may be observed up to the 4th-6th group of 100 judgments. In making anthropometric measurements one cannot take so many reactions from a single individual as this would outrage the principle of the time required to obtain the judgments.

On the other hand, the small number of determinations advocated by certain writers is obviously too small. Whipple,[5] for instance, advocates the taking of only 10 determinations; but in the light of our findings such a procedure may furnish an exceedingly uncertain and inaccurate measurement of the sensitivity of the individual. If the interval of uncertainty is so much larger for a group of 25 judgments upon each

[5] G. M. Whipple, *Manual of Mental and Physical Tests.* Baltimore, 1910, 188-193.

comparison pair than that for 100 judgments, we must certainly conclude that any procedure which employs less than 25 judgments is mischievous and inadmissible.

The anthropometrist finds himself between Scylla and Charybdis; if he makes a large number of determinations he sacrifices more time than is ordinarily at his disposal, and if he makes a small number of determinations his results are inaccurate and valueless. And in his extremity he may very pertinently inquire: What is the least number of determinations upon which the measurement of an individual's sensitivity may safely be based? In the light of our findings it would appear that 50 determinations upon each comparison pair is the smallest number upon which an accurate measurement can be based. We have also found that an average subject may be taught the technique of lifting and also that we may obtain 50 judgments on each comparison pair by our methods within a single session of an hour's duration. This includes frequent and sufficient rest-periods. This arrangement, furthermore, has the advantage in that the subject is not kept too long at the task; and on the other hand, may be disposed of in a single session. We believe that an hour for the determination of the sensitivity of each subject is not too much to ask from either the anthropometrist or the clinician. Indeed, our results show that he must spend this time if he is going to employ lifted weight experiments to obtain results which will have an admissible degree of accuracy.

Obviously it is well to obtain as many judgments as possible, because the greater the number of judgments the greater will be the accuracy of the determinations. But in anthropometric measurements, the time required for the obtaining of the results is an important factor, and hence one is impelled to set arbitrary limits as a sort of compromise between accuracy and time. We suggest, on the basis of our results, that 50 judgments upon each of 5 comparison pairs is a sufficient number to require from each subject for the ordinary anthropometric study. Our results show that the values obtained do not vary greatly from those obtained from a group of the first 100 judgments. The first 50 judgments upon each pair of stimuli may be obtained within the space of one hour's sitting, including the preliminary practice in the technique of lifting. We do insist that no determination of less than 50 judgments upon each comparison pair is admissible inasmuch as the results obtained violate the principle of accuracy. The divergences in the results are due to the effect of the progressive practice obtained by the subject during the experi-

mentation. The effect of this progressive practice is to increase the values of the coefficients of precision and to decrease the size of the values of both the interval of uncertainty and to a less degree of the point of subjective equality. The effects of this progressive practice are stronger at the beginning of the experimental series and decrease at first rapidly and then more slowly as the experimentation continues.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY

Communicated by E. B. TITCHENER and H. P. WELD

XXVII. SIMPLICITY VS. COMPLEXITY OF COLOR HUES

By E. M. ALSPACH

In the experiments here reported, we have sought to obtain introspective evidence with regard to the alleged compositeness of color hues. The opinions of psychologists and color-theorists concerning the existence of composite colors may roughly be classified into three groups. (1) All colors, with the exception of black, white, red, yellow and blue are composite; orange, for example, is composed of red and yellow; green is composed of blue and yellow. (2) In addition to the simple colors of the first group, green is also simple. It is true that green may be obtained by mixing blue and yellow pigments; but still it is a quality which is neither blue nor yellow; and it cannot, therefore, be factored into blue and yellow. All other colors, however, are composite. (3) No colors are composite; all colors are psychologically simple. The psychological orange may be obtained by a psychophysical mixture of red and yellow, but the resultant quality is simple; however *like* red and yellow it may appear, it cannot be analysed into these two components. Bentley has shown that this disagreement is partly a result of different methods of analysis, partly of a confusion of the psychological and the psychophysical points of view.[1] In this paper we shall avoid, so far as possible, all theoretical considerations: if our problem has any relation to color-theory, it is indirect; and all arguments from qualitative opposition, color-mixture, contrast, color-blindness, etc., are beside the point. We are concerned solely with psychological (not logical, psychophysical, physiological, physical, or technical) analysis of color hues.

It has been pointed out above that those who believe in the existence of composite hues do not agree among themselves, and that their disagreement turns on the character of green. The principal advocate of composite green is Brentano.[2] He approaches the problem phenomenologically; he thinks that he can see B and Y in green; and he calls to witness Goethe and many other persons, especially painters, who are assumed to be especially skilful in the analysis of colors. With his position Holt[3] is in agreement. This view means that if all the hues between Y and B are arranged in a series, they fall on a single straight line, and G lies about the middle; just as O lies in the middle of the R-Y series. Katz[4] argues against the position on the ground that the two series, when directly compared, are not in all respects similar; a hue, for example, which lies in

[1] M. Bentley, The Simplicity of Color Tones, *Amer. Jour. Psychol.*, xiv, 1903, 92 f.

[2] F. Brentano, *Untersuchungen z. Sinnespsychologie*, 1907, 1 ff; 129 ff.

[3] E. B. Holt, The Place of Illusory Experience in a Realistic World, in *The New Realism*, 1912, 333 ff.

[4] D. Katz, *Die Erscheinungsweisen der Farben*, 1911, 276 f., 360 ff.

the B-Y series near the Y appears greenish, not bluish; while a hue occupying a similar position in the R-Y series appears not orangeish but reddish. Furthermore, it is not true that painters are more skilful in the psychological analysis of color than are psychologists themselves. The two professions have different points of view; when the painter analyses a color, his problem is to determine what pigments will reproduce that color on his palette; he, therefore, 'sees' in a given hue the colors of its pigment-components; while the psychologist sees hues which are similar to other hues.

The painter, now, would willingly accept the challenge to reproduce the seen color from the 'seen' components. Brentano also, if we take him at his word, would accept this challenge. "Die Aehnlichkeit, die Orange einerseits mit Rot und anderseits mit Gelb hat, ist nicht derjenigen zu vergleichen, die etwa einem Ton zwischen *c* und *e*, z.B. dem zwischen ihnen gelegenen *d*, mit jenem tieferen und diesem höheren Ton zugeschrieben werden kann, sondern offenbar derjenigen, welche der Zweiklang *ce* mit den beiden Komponenten zeigt. Man erkennt darin die beiden Farben, wie man dort die beiden Töne heraushört."[5] Composite colors are fusions, then, similar to tonal fusions, and may be analysed in the same way. We may suppose, therefore, that as in the analysis of the tonal fusion *ce* we come out with two tones, which may be named by their vibration frequencies, and which when produced together will reproduce the original fusion, so in the analysis of a color fusion we should be able to name or point out the components, and thus to reproduce the original fusion. The obvious test is recourse to experiment.

We know of only two attempts to attack the problem experimentally. Katz[6] reports an experiment with 80 school-girls, 8-9 years of age, who presumably had no knowledge of color-mixing, but who named the colors correctly. They were unable to analyse successfully either orange or green, although they had been shown how a violet could be obtained by mixture, and although in most cases they were clever enough to avoid choosing the same pairs of components in both cases. Mrs. Ladd Franklin,[7] who has long contended that R, Y, G and B are 'psychically unitary,' and that the intermediate colors are non-unitary colors or 'color-blends,' has devised an experiment, the results of which, she thinks, proves her position. She has not published her results in detail, however, and we have deemed it advisable to repeat her work. Her method will be discussed, later, in connection with our own results.

Those psychologists who believe in the simplicity of color hues contend that what their opponents 'see' in colors is only a *likeness* to other colors; that O, for example, is *like* R and *like* Y, not that O *is* R and Y. Bentley long since pointed out that the colors about the base of the color pyramid fall into two major groups; "the one contains the reds and yellows, the other the greens and blues. Within each group there is a special kinship which marks off one group from another."[8] Katz, who is very cautious as regards the com-

[5] *Op. cit.*, 16.

[6] *Op. cit.*, 366 f.

[7] C. L. Franklin, Determination of the Psychically Unitary Color-Sensations, Report of the Philadelphia Meeting of the Amer. Psychol. Asoc., *Psy. Bull.*, xii, 1915, 62 f.

[8] *Op. cit.*, 92 f. H. E. Houston and W. W. Washburn *Amer. Jour. Psy.*, xviii., 1907, 523) find no overlap of the names B and Y, and argue from this fact that the two colors cannot be visible in G.

posite nature of O and V, remarks that in his experience G has a similarity to the colors Y and B which is greater than that existing between G and R. In Westphal's experiments, where among others the best G (*Urgrün*) was determined, Katz reports as observer that the same stimulus appeared *successively* bluish and yellowish; but, he adds, "die spurenweise Andeutung der Nachbarfarben in den Urfarben, wie sie bei dieser Einstellung vorhanden ist, ist natürlich von ganz anderer Art als das Enthaltensein je zweier Urfarben in den zwischen ihnen liegenden Farbentönen, z.B. des Rot und Gelb in dem Orange."[9] What this difference is he does not say; he thinks that the brightness and the feeling-tone of G lie midway between those of B and Y (the same thing might be said also of R); but he does not commit himself with regard to the composite character of O and Y. Westphal found that, in the determination of *Urfarben* (e. g., *Urrot*), it is not always possible for the observer to fix the point where the hue concerned does not evince a close relation to the neighboring hues (*weder gelblich noch bläulich erscheint*). If, he continues, Brentano concludes that the sensation green is a sensation yellow-blue, because some persons can see Y and B in it, then with equal right one may conclude that the sensation R is yellow-blue, and the sensation Y is red-green.[10]

In view of this divergence of opinion, we (1) planned an experiment which we hope is without prejudice, and which is purely analytical in its nature; (2) we have repeated Mrs. Ladd Franklin's experiment; and (3) we have performed a variant of Westphal's experiment. The procedure of these three experiments, together with their results, will be taken up in order.

Experiment I

The object of this experiment was to test the observer's ability to analyse colors, and to compare the results with those of observers who selected colors which were 'like' the stimulus. We employed as stimuli the following colored papers, all of the best available chroma and medium tint: R, O, YO, Y, YG, G, BG, B, V, P; and, in addition, both light and dark tints of O, G, V, and a medium tint but poor chroma of O, G, B and V. The O was taken from the Milton Bradley Co.'s Pure Spectrum Scales; all the other stimuli were Hering papers. The tints and lesser chromas were obtained by mixing in the requisite amounts of Bk-W.

The observer sat at a table facing a screen. The screen had a square window, which could be closed by a shutter. Immediately behind the screen stood a color-mixer, upon which the various stimuli were shown. On the table before the observer was a tray of sample colors, 3 x 6.5 cm., mounted on grey cardboards of slightly larger size. These color samples, 130 in number, were representative of the entire color circle with varying hues, tints and chromas, and also included a few greys.

When the stimulus was presented, the observer was asked the following question: "Does it appear simple (homogeneous), or do you see other colors in it?" In case he reported 'simple,' he was asked: "Is it like any other color?" If the answer was 'yes,' he was then

[9] *Op. cit.*, 363.

[10] H. Westphal, Unmittelbare Bestimmungen der Urfarben, *Zeit. f. Sinnesphysiol.*, xliv, 1909-10, 198, 230 n.

instructed: "Choose (from the samples) the colors which it is like." But if the answer was 'no,' he was asked to name the presented color, and the experiment came to an end. If, however, in answer to the first question, the observer found 'other colors' in the presented color, he was then instructed: "Choose (from the samples) the colors that you see." When this had been done, he was asked to name the colors he had chosen, and also to name the stimulus color.

After the experiments had progressed for some time it seemed advisable to reduce the number of stimuli by striking out the YO, the P, the light and dark tints, and the lesser chromas, since these colors did not yield results sensibly different from the others. In the experiments which we shall report, therefore, we employed eight stimuli, all of the best possible obtainable chroma. We had twenty-three (in some cases twenty-four) observers. About half of the observers had had some training in psychological observation; some were instructors in psychology, others were students in the psychological laboratory; of the other half, four were girls, 12-15 years of age, who had had some experience with mixing pigments, and the remainder were college students taken at random. We give the results in Table I. In preparing the table we have grouped the colors which were chosen as 'likes' or as 'components' into 19 classes, represented by the color symbols at the head of the vertical columns; e. g., the column R contains all the hues which were distinctly red (neither bluish nor yellowish), but which differed in chroma, tint, texture, etc. We have classified the observers into trained (Tr) and untrained (Un), and also according to the nature of their judgments (simple or composite). The Table, then, shows the distribution of the colors chosen by each of the two classes of observers, and according to the two types of judgment. It should be remarked that, in the instruction given, there was no limit to the number of colors which an observer might choose as 'like' the stimulus or which he might 'see in' the stimulus; the sum of the numbers on a horizontal line is therefore often greater than twice the number of observers.

There are three gross results. (1) The judgments of likeness and of composition of color hues can be made, and are made, by all observers, trained and untrained. But, in general, the choice of components shows practically the same distribution as the choice of likes; so that the basis of judgment in the two cases is perhaps similar, if not identical. (2) Only in exceptional cases are R, Y, G, and B reported as components of (or as like) the stimulus color. The principal exception is that, when one of these colors is itself the stimulus, it is most 'like' itself, or is 'composed of' itself. In the case of intermediate colors, O, YG, BG, and V, the tendency of distribution is *not to reach* the corners of the color square. (3) There is evidence, in judgments both of simplicity and of complexity, that the observer tends to restrict his choices to a single side of the color square. Thus in the case of intermediates the distribution is approximately symmetrical, whereas in that of the corner colors the tendency is for the judgments to occur only on the one side; this latter tendency is greater for R and Y than for G and B.

It seems to us that, in the face of these results, but one conclusion is possible; that, whatever some of our observers saw in the stimulus, they did not see component colors. So far as this experiment goes, our results are totally at variance with the view that the intermediate colors are fusions or blends, comparable with tonal fusions. Further-

TABLE I

Stim.	No. of Obs.	Judgment	VR	R	OR	RO	O	YO	OY	Y	GY	YG	G	BG	GB	B	VB	BV	V	RV	Bk-W
R	7 Tr	simple	....	6	3	1	....	1	2	....	....	....	....	....	....	....	....	....	....	....	.....
	7 Un	"	....	6	1	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....	.....
	4 Tr	composite	....	2	2	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	2
	5 Un	"	....	3	1	....	....	1	1	1	....	....	....	....	....	....	....	1	....	....	2
O	9 Tr	simple	....	....	4	1	8	....	4	1	....	....	....	....	....	....	....	....	....	....	.....
	6 Un	"	....	....	....	1	6	1	....	....	....	....	....	....	....	....	....	....	....	....	.....
	3 Tr	composite	....	....	1	2	1	....	2	....	....	....	....	....	....	....	....	....	....	....	.....
	6 Un	"	....	1	2	1	3	1	1	2	1	....	....	....	....	....	....	....	....	....	.....
Y	6 Tr	simple	....	....	....	....	....	....	1	7	3	1	....	....	....	....	....	....	....	....	.....
	9 Un	"	....	....	....	....	....	....	1	6	1	3	....	....	....	....	....	....	....	....	.....
	5 Tr	composite	....	....	....	....	....	....	....	6	4	3	....	....	....	....	....	....	....	....	.....
	3 Un	"	....	....	....	....	....	....	....	3	1	....	....	....	....	1	....	....	....	....	.....
YG	6 Tr	simple	....	....	....	....	....	....	....	2	1	7	1	....	....	....	....	....	....	....	.....
	4 Un	"	....	....	....	....	....	....	....	....	3	4	....	....	....	....	....	....	....	....	.....
	5 Tr	composite	....	....	....	....	....	....	....	4	1	5	3	....	....	....	....	....	....	....	.....
	8 Un	"	....	....	....	....	....	....	....	4	4	3	3	....	....	1	....	....	....	....	.....
G	10 Tr	simple	....	....	....	....	....	....	....	2	1	3	9	2	....	....	....	....	2	....	.....
	4 Un	"	....	....	....	....	....	....	....	....	....	1	3	....	....	....	....	....	....	....	.....
	1 Tr	composite	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	2
	8 Un	"	....	....	....	....	....	....	....	3	3	....	7	1	....	....	....	....	....	....	1
BG	6 Tr	simple	....	....	....	....	....	....	....	....	1	....	1	6	1	....	....	....	....	....	.....
	5 Un	"	....	....	....	....	....	....	....	....	....	....	....	7	1	....	....	....	1	....	.....
	6 Tr	composite	....	....	....	....	....	....	....	....	....	2	2	3	2	1	1	....	....	....	3
	7 Un	"	....	....	....	....	....	....	....	1	....	....	1	5	4	1	....	....	....	....	.....
B	11 Tr	simple	....	....	....	....	....	....	....	....	....	2	2	....	....	11	2	....	1	....	.....
	10 Un	"	....	....	....	....	....	....	....	....	....	....	....	1	1	11	1	....	1	....	.....
	1 Tr	composite	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
	2 Un	"	1	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	.....
V	7 Tr	simple	1	3	....	....	....	....	1	....	....	....	....	....	....	1	2	1	5	1	.....
	6 Un	"	1	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	5	2	.....
	5 Tr	composite	2	1	....	....	....	....	....	....	....	....	....	....	....	1	1	....	3	....	2
	6 Un	"	2	1	1	....	....	....	....	....	....	....	....	....	....	....	2	1	4	....	.....

more, as regards the question of the composite character of green, we point out: (1) that the distribution of choices, whether of similars or of components, conforms to the type of distribution for the other corner colors; (2) that in no case is a blue or even a greenish blue chosen as a component of G; and (3) that those who 'saw other colors' in the stimulus most frequently chose, as components, colors which belonged to the same group as the stimulus. These facts all tell against the composite character of green.

Finally, we remark that, on the basis of similarity, or because some observers can see other colors in them, the corner colors themselves, B alone excepted, might be regarded as composite. It is true that we employed colored papers, which are notoriously impure; but then pigments are also impure; and our results are in accord with those of Westphal, who employed spectral lights as stimuli.

Experiment II

We thought it well, at this point, to repeat Mrs. Ladd Franklin's experiment. The only published account of her method and results is as follows. "By exhibiting at once (say) seven colors, on discs rotated by a common electric motor, made practically equal in intensity and saturation but just noticeably different in color tone, it is found that all observers can distinguish between the unitary colors and the color blends. The judgment is a perfectly easy one to make; none of our observers failed to make it save one, and he turned out to have dichromatic vision—which involves of course the impossibility of ever seeing a color blend."[11] We have supplemented this meagre account of method by written notes taken from Mrs. Ladd Franklin's verbal report at the Philadelphia meeting. The experiment as we performed it was as follows. In a first series, we set up seven compound discs which, when rotated, gave a series of colors practically equal in tint and chroma but just noticeably different in hue, passing from a bluish red through red to a yellowish red. In a second series, the hues ranged from a reddish blue through purple to a bluish red; and in a third series, from a yellowish red through orange to a reddish yellow. The instruction for the first series was: "Pick out a color which is neither bluish nor yellowish. Which colors are bluish? which colors are yellowish?" The instruction for the second series was the same, except that 'reddish' was substituted for 'yellowish.' When the results from this instruction (which was Mrs. Ladd Franklin's) had been obtained, we supplemented the instruction by asking: "Which colors are unitary? Which are complex?" In the third series we further modified the instruction by asking the five questions: "Which colors are yellowish, which are orangeish? Which are reddish? Which are complex? Which are unitary?" There were 16 observers, four of whom were trained, six were taking their first course in the laboratory, and the remaining six had had no experience in psychological observation. The results appear in the following Tables, which show the distribution of the judgments for each one of the seven discs.

[11] *Op. cit.*, 63.

TABLE II

SERIES 1

	BR			R			RY
Number of disc.....	1	2	3	4	5	6	7
Bluish.....	16	16	8	.....	.....	.....	.....
Neither B nor Y....	.....	.....	8	13	2	.....	.....
Yellowish.....	.....	.....	.....	4	15	16	16
Complex.....	10	11	8	6	8	12	11
Unitary.....	6	5	8	10	7	4	5

SERIES 2

	BR			P			RB
Number of disc.....	1	2	3	4	5	6	7
Bluish.....	15	16	15	10	8	7	6
Neither B nor R.	1	.....	1	5	2	.....	1
Reddish.....	3	4	6	9	13	15	14
Complex.....	4	8	8	10	10	10	6
Unitary.....	12	8	8	6	6	6	10

SERIES 3

	YR			O			RY
Number of disc.....	1	2	3	4	5	6	7
Yellowish.....	6	5	6	8	13	16	16
Orangeish.....	5	7	9	13	14	7	4
Reddish.....	16	15	14	13	8	3	2
Complex.....	7	9	8	8	10	9	4
Unitary.....	9	7	8	8	6	7	12

These results, we suppose, would have been satisfactory to Mrs. Ladd Franklin,—had we not asked for judgments of unitariness and complexity! As they are, they do not bear out her conclusion that "all observers can distinguish between the unitary colors and the color blends." Of the 16 observers, 6 regard red as complex, and 5 find neither red nor blue in purple. A still more curious result is that for O in the 3rd series: 13 see it as reddish, 13 as orangeish, but only 8 see yellow in it, and only 8 see it as complex; evidently, some persons do not see yellow in orange, and some see orange as unitary. Such examples might be multiplied; but it is obvious that, although the form of the curves for bluish, neither bluish nor reddish, and reddish might be satisfactory to Mrs. Ladd Franklin, the fact that *on the average only one-half of the observers regard the colors in the R-B series and in the R-Y series as complex* does not square with her logical conclusion that resemblance implies common character, and that since purple (for example) resembles both R and B, it must therefore be psychologically a color blend. Because

of this confusion of the logical and the psychological methods of analysis, the method of this experiment is inadequate to the problem; and for the same reason the results are at variance with those of our first experiment.

Experiment III

In this experiment we attacked the problem of the compositeness of green by a metric method. We prepared discs of blue-green and yellow-green, which were not so far removed in the color series but that, by the second law of color mixture, their mixture gave a green of good chroma. With a preponderance of the BG the mixture was decidedly bluish; and with an excess of YG the mixture was distinctly yellowish. The problem was to determine the points of change on the one hand between blue and not-blue, and on the other hand between yellow and not-yellow. The method employed was that of Constant Stimuli. Five stimuli were selected, with intervals of 3°. These were arranged by hazard into 100 series, so that 500 observations were made under each instruction. In the first experiment the instruction was: "You are to judge Bluish or Not-bluish." The observer was told, emphatically, that 'not-bluish' did *not* mean yellowish or greenish or pinkish; it meant not-bluish and nothing more; he was also urged to make every effort to keep his attitude constant throughout the experiment. In the second experiment the categories were 'yellowish' and 'not-yellowish,' and the observer was further instructed as in the first experiment. We hoped, by thus formulating the instructions, to accomplish two things: (1) to eliminate the question of green entirely (it will be apparent that only by implication can 'green' come into our final results), and (2) to discover whether or not it is possible, under experimental conditions, to carry a single attitude ('bluish' or 'yellowish') through the Blue-Yellow series. We believe that on both counts we have weighted the experiment, if at all, in favor of Brentano's contention. The observers were Dr. L. D. Boring (L. D. B.), Dr. W. S. Foster (F), Dr. E. G. Boring (B), and Miss M. E. Wright (W), a student in quantitative psychology. The first three observers have had long experience in psychological observation. Only the last two, however, were able to complete the entire series; and although the others completed the preliminary series and proceeded far enough in the experiment proper to give an indication of the final outcome, we shall not consider their quantitative results. In the Table which follows the value of RL equals degrees of YG.

TABLE III

		RL	h	Interval btwn. Y and B
Obs. B.	Bluish or not.....	87.868	.1669	12.627
	Yellowish or not.....	75.241	.1640	
Obs. W.	Bluish or not.....	44.868	.1092	17.024
	Yellowish or not.....	61.492	.1315	

These figures mean that, for both observers, the blue-yellow series is neither blue nor yellow throughout its course: there is a point (in the sense of a limen) where blue changes to not-blue, and an-

other point where yellow changes to not-yellow. There is a difference, however, between the two observers. For B. the blue and yellow areas cross each other; or, to put it in another way, there are in the B-Y series (1) an area that is bluish but not yellowish, (2) an area that is *both bluish and yellowish,* and (3) an area that is yellowish but not bluish. For W., on the other hand, the two extreme areas do not meet; there is an intermediate area that is *neither bluish nor yellowish.* It is clear that either result is fatal, so far as this experiment goes, to Brentano's notion that all colors between blue and yellow are components of these two extremes.

While, as has been said, the other two observers did not complete their series, the results obtained agree in principle with those of W. The intermediate interval (neither bluish nor yellowish) for F. was about 21°, for L. D. B. about 16°. The introspections also show that these three observers had difficulty in carrying their instruction through the region of green. W. says: "About the middle of the series, judgments of yellowish and bluish are difficult. . . . Green is so pronounced that it is hard to say whether the color is yellowish or bluish." L. D. B. reports: "I think of the color series from Y to B through G as a straight line, and I attempt to place the stimulus in position with reference to that series. . . . There are times when, disregarding my *Aufgabe,* I asked myself 'Is it yellowish or bluish green or just a good green?'" F. also reports: "Sometimes visual images of the spectrum come up, particularly the green and yellow parts; green is seen in such cases. The chief processes are auditory kinaesthetic words; but besides these visual image of true green, and (rarer) a visual image of yellow." B., on the other hand, was frequently influenced in his judgment by secondary criteria, and perhaps on this account was better able to disregard the insistency of green. He says: "The judgment 'yes' (Yellowish) is a positive reaction on my part to the stimulus; the yellowish hue is somewhat alive, keen, sharp, bright, not smooth, not uniform; early in the experiment I wondered whether yellowish might not be a slight painful complex in the eyes. The judgment 'no' (Not-yellowish) is an equally positive passive acceptance. The presentation is smooth, comfortable, quiet, calm; I don't know how much of this is my reaction, and how much is immediately inherent in the color. . . . The blue was soft and comfortable as against the blare of the yellow; all a matter of eye pressures and pains."

The color experience in these experiments did not always appear simple. Three of the observers occasionally reported a 'haze' over the color; for W. and F. this was yellowish, and influenced their judgments. B., who has given the most complete account, says: "Sometimes I think I see spots that are more bluish than others or perhaps are even blue; sometimes these spots give the impression of seeing the disc through a bluish haze; sometimes the spots or haze seem to come and go as if due to a fluctuation of attention or determination. The vagueness of this haze makes me wonder whether it is a haze at all, or whether it is not a shifting underdetermination to a tied image, like a memory-color." "In general the 'yes' hue was complex, whereas the 'no' hue was simple. I mean that in taking the hue as yellowish I never took it as yellow, but always as if yellow were a part of it. The 'not-yellow' was always just something that belonged all together, seldom green or blue, but smooth. I do not know what the nature of the yellowish component is. I should guess that it is either my organic reaction to the stimulus or something like a memory-color which, under this

determination, spreads over the disc or at least spreads over it intermittently. The intermittence does definitely occur; in case of hesitation the hue is now yellowish (complex), and now just something else (a simple green or yellow green). I have thought that this intermittence was exactly like the intermittence that one gets in hearing out the components of a clang."

Conclusions. The results of our first experiment bespeak the simple character both of the intermediate colors and of green; and those of the third experiment also conflict with the alleged composite character of green. The results of the second experiment are equivocal because of inadequacy of method. The results of the first and third experiments are unequivocal; however 'like' a hue may be to neighboring hues, it apparently cannot be resolved by purely psychological methods into these hues as 'components.'

Secondly, the experiments seem to show that, when an observer thinks he 'sees other colors' in a stimulus, he is really perceiving a resemblance to other colors.

Thirdly, a new problem emerges. One does not simultaneously see R and Y in O; the two similarities appear successively, and only with a shift of attitude. There is evidence that the shift of attitude brings with it something more than a shift of clearness, and further experiments must be made to determine what this 'something more' may be.

Fourthly, we find, as Westphal found, that of all hues B is most like itself. The roughness of our materials is, we suppose, at any rate partly responsible for our failure to get a definite confirmation of Westphal's further rank-order: Y, G, R. But it is clear that Westphal's psychological interpretation of individual differences in the determination of *Urfarben* should be put to the test of further experiments.[12]

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[12] Westphal, *op. cit.*, 198, 213 ff. From the phylogenetic point of view, there is a certain plausibility in the hypothesis that B and Y are the only psychologically pure colors, and that R and G are psychological compounds of B and Y. No one, however, so far as we know, has maintained the composite character of R, although the structural likeness of the series B-R-Y and Y-G-B might logically have suggested it. Moreover, the argument from phylogeny must always, in matters of psychological observation, be secondary; the question of this paper, as we said above, is psychological and not biological.

BOOK REVIEWS

Standardization of Tests for Defective Children. By CLARA SCHMITT. *Psychol. Monog.*, 1915, 83. pp. 181.

The tests used are from Healy and Binet, the subjects comprising the kindergarten and first 6 grades of a private school in Chicago, though clinical experience is interwoven with the treatment of them. The clinic must discard time for the most part as an important factor in the measurement of results. Some other measure, preferably a qualitative one, must be substituted for this quantitative one. The clinic must discard rigorous laboratory conditions and adjust its tests to conditions more in conformity with those of everyday life. It must discard such apparatus as requires practice on the part of the subject, or as is not directly connected with the object of the test. A detailed review of the Binet-Simon tests is given, followed by a critical chapter. Their faults may be summed up as (1) the assumption of serial mental development from early childhood to adult age. (2) The omission of tests of socially significant abilities. (3) Failure to distinguish certain innate abilities from a certain expression of them due to age or experience. (4) The series is not an accurate measure of mental development of normal children. (5) The assumption that a defective is quantitatively rather than qualitatively different from a normal individual. The reactions to the Binet-Simon tests are presented in detailed tables. The Healy-Fernald tests were devised with a view to obviating some of these difficulties as well as minimizing the language factor. Correlations of puzzle box and cross line tests with school grade are given. A summary of the standardization of the Healy-Fernald tests presents the relations of these tests to age and grade. There is a chapter on school subjects as tests of mental ability, and the monograph concludes with a division of all the varieties of tests into four classes, each representing a different mental level. The first two belong to the normal grade of mental ability. The mental processes of the upper grades of the defective classes are made upon levels III and IV. The classification could be continued downward to include more fundamental processes such as sensory discrimination as distinguished from such constructive activities as are involved in the lowest level here given.

The Importance of Social Status as Indicated by the Results of the Point Scale Method of Measuring Mental Capacity. By ROBERT M. YERKES and HELEN M. ANDERSON. *Jour. of Educ. Psychol.*, 6, 1915. pp. 137-150.

The authors give a detailed summary of the point scale for testing intelligence. They then present briefly the results of point scale examinations in two city schools which differed radically in the economic and social status of their pupils. The method was to select from the unfavored group an individual of the same sex and of the same or approximately the same age as a given individual of the favored group. 26 boys and 26 girls were in each group. In only one test were the unfavored group superior to the favored. The total scores of the unfavored boys were 21% less, those of the girls 20% less

than the favored groups respectively. In the individual records all the unfavored six-year-old boys are below the average of the six-year-old favored boys. In only two cases are six-year-old girls above the average for the favored. Differences in economic or status seem to be correlated with differences in mental capacity so measured which may amount to as much as 30%. It is the conviction of the authors that in the greater part of the practical work of recent mental examination this factor has been neglected. It is proposed to standardize the point scale method so that the mental ability of a subject may be expressed in its relation to the group in which he belongs.

Diagnostic Values of Some Performance Tests. By THOMAS H. HAINES. *Psychol. Rev.*, 22, 1915. pp. 299-305.

In a group of institutional girls the Binet and Point Scale ratings of intelligence set apart three groups consisting of 21 high-grade morons, 16 of doubtful defect and 26 of no defect. Further study of these cases was made by the tests enumerated below. Some of the tests gave significantly different averages in each group and others distinguished some one group from another. A test of moral discrimination is detailed, and though it does not differentiate the groups it suggests to the author the need of studying ethical foundations in the minds of girls. The findings for differential diagnosis of the three groups are summarized as follows: (1) Tests of Value for Both Distinctions, The Picture Form Board, Construction Puzzle (A), The Opposites. 2. Tests Good for Differentiation of the Not Defective from the Doubtful, The Labyrinth (B), The Cross Line (B). 3. Test Differentiating the High-grade Defective from the Doubtful, Visual Verbal Memory, Auditory Verbal Memory. 4. Tests of Doubtful Diagnostic Value, Completion. 5. Tests Showing No Definite Diagnostic Value, Construction Puzzle (B), Learning, Motor Co-ordination, Moral Discrimination.

Point Scale Ratings of Delinquent Boys and Girls. By THOMAS H. HAINES. *Psychol. Rev.*, 22, 1915. pp. 104-109.

The Yerkes-Bridges point scale for measuring intelligence has certain advantages over the Binet scale in that different groups are more comparable by it; it allows the individual to make credits in any tests while the Binet credit depends upon passing in a narrow range of tests. After making the point scale tests a few short additional tests will complete the Binet rating so that the two may be conveniently compared. In work of this nature done by the author the results are closely parallel, the point scale results, as one would expect from the above, running a little higher. Tables are given showing the comparison of the Binet and point scale ratings in low grade, medium and undefective boys and girls. In the cases classed as "doubtful" where the Binet age is about 11 and the point scale averages considerably higher, about 14, it is felt that the point scale method contributes especially to the analysis of the case.

The Standardization of Knox's Cube Test. By R. PINTNER. *Psychol. Rev.*, 22, 1915. pp. 377-401.

The material is derived from tests of 867 normal children and a few adults, also 463 feeble minded. In the test four cubical blocks "are placed on the table in front of the subjects at a distance of about 2 inches apart. The examiner holds the fifth cube in his hand. He says to the subject, 'Watch carefully and then do as I do.' He

then taps the blocks with the fifth cube in a certain definite order and at a certain definite rate (about one tap per second), always beginning with the cube at the child's left or the examiner's right if he is facing the child. He then lays the fifth cube down in front of the child, equidistant between the third and fourth cube, but nearer to the child, and says, 'Do that.'" The blocks were tapped in 12 different ways, designated lines A-J. The complexity of the pattern which can be followed is the index of performance in the test. Curves are given showing the percentages of correct responses for each age and how the patterns ("Lines") compare with each other in difficulty. These curves are quite significant for the author. In defining the age limit of a test he would require about 60% passes but considers that beyond that the best age for placing a test will depend on the shape of the curve showing a percentage of passes at each age. The correct passing of three of his lines, BCD, is delayed until about the fourteenth year. The test may be also evaluated in terms of the number of lines passed correctly at each age. The results gained in this way are about the same as by considering special groups of lines, which is his first described method. In 20 cases the Binet ages were available for comparison and the author considers it surprising that any one test should come so near the results arrived at by a whole series of tests. Two definite types of errors, perseveration and reverse order, are noted. Normal children on the whole do slightly better in the cube test than the feeble minded of corresponding mental age. In summary he gives performances in the test, either by the group method or the actual number of lines method of scoring, which correspond to mental levels of 5, 6, 7, 10, 14 and 16 years. He considers that the child should be credited with the age at which the most difficult combination is passed.

The Adequacy of the Laboratory Test in Advertising. H. F. ADAMS. *Psychol. Rev.*, 22, 1915. pp. 402-422.

The feasibility of predicting through a simple experiment the relative amount of business which different advertisements will bring in is indicated in the writings of Strong and Hollingworth. The general conclusion is drawn that the laboratory test is a satisfactory preliminary in advertising. It was thought that mail order advertising would be worth studying in this connection. A satisfactory measure of the pulling power of an advertisement is not easy. Factors of follow-up, salesmanship and the like seem to make the number of inquiries per insertion the fairest measure. The laboratory tests do not determine whether an advertisement is absolutely good or bad, but only relatively to other members of a series. The figures quoted from the author's experiments show "simply chance resemblance between the results of the laboratory test and the average number of inquiries per insertion, and very little better than chance resemblance between the laboratory test and the business test where profits are used as a measure. . . . With a mail order business it is possible to get returns which are extremely accurate so such advertisements would make the best material for laboratory tests if such tests would only work." College students are however not fair representatives of the mail order purchasing public. The author has been led to question the application of the order of merit method to advertising problems and the previous experiments seem open to attack on several sides. The elaborate keying necessity is impossible with many commonly used articles. Further, the results obtained from laboratory testing are as though the whole hundred per cent of readers were tested instead of

the ten per cent who would on the average be interested enough to answer the advertisement. Further, there is the difficulty of any person's telling experimentally just what his actions will be.

Die Abwehrfermente Abderhalden's in der Psychiatrie. By F. Sioli. *Archiv für Psychiatrie*, 55, 1915. pp. 241-271.

A comprehensive digest of the literature is presented, and the author appends some comparative observations, using an organ in different stages of disease. There were 15 cases altogether, of whom 10 were senile dements. The author concludes from the literature as well as from his own observations that the results from the Abderhalden and allied methods are not yet sufficiently clear to be used for purposes of diagnosis and prognosis or pathogenetic theory.

F. L. W.

Proceedings of the Society for Psychical Research, Volume XXVIII. Glasgow University Press, 1915.

The twenty-eighth volume of the Society for Psychical Research (1915) devotes its 657 pages to a "Study of the Psychology of Mrs. Piper's Trance," by Mrs. Henry Sidgwick. According to a list printed at the beginning this brings the total number of pages published by the Society on Mrs. Piper to 2812, the first one coming out in 1890, and yet so dubious is the outcome that Mrs. Sidgwick concludes: "To sum up very briefly my own conclusion about Mrs. Piper's trance, I think it is probably a state of self-induced hypnosis in which her hypnotic self personates different characters either consciously and deliberately, or unconsciously and believing herself to be the person she represents, and sometimes probably in a state of consciousness intermediate between the two. In the trance state her normal powers transcend in some directions those of her ordinary waking self, as is often the case in hypnosis. And further—what makes her case of great importance—she can obtain, imperfectly and for the most part fragmentarily, telepathic impressions. . . . It seems to me impossible at present to prove any theory on the subject." But at the beginning, Mrs. Sidgwick expresses herself thus in capitals (p. 6): "To prevent misapprehension, I am anxious to say emphatically at the very beginning of my discussion that I have no doubt whatever that knowledge is often exhibited in the course of Mrs. Piper's trance utterances which can only have reached her by some supernormal means—by which I mean otherwise than through the ordinary channels of sense," and she inclines to believe that this includes not only telepathy from the living but from the dead. Again, she recognizes that the "communicators" cannot be taken at their face value. "All these points being taken into account, grave doubts are thrown on the genuineness at any time of the dramatic presentation of the communicator. Veridical communications are received, some of which, there is good reason to believe, come from the dead and therefore imply a genuine communicator in the background. But the dramatisation of even genuine communicators, with the whole dramatic machinery employed, is probably merely dreamlike."

If such a wavering stand is the outcome of over thirty years of work, by various individuals, who were from the beginning at least sympathetic with the spiritistic hypothesis, on the "medium" who is generally admitted to give the best returns with the least suspicion of deception, what is the probability of spirit communication?

Amy E. Tanner.

Essays Towards a Theory of Knowledge. By ALEXANDER PHILIP. New York, E. P. Dutton & Co., 1915. 126 p.

This little volume comprises four chapters, entitled respectively, *Time and Periodicity, The Origin of Physical Concepts, The Two Typical Theories of Knowledge,* and *The Doctrine of Energy.* The thesis which the author is concerned to prove is that the fundamental reality is energy and that we must take our clue for the interpretation of experience, not from abstract thought or sensation, but from activity. The two typical theories of knowledge which he combats are (a) the intellectualistic, which "seeks in some way or other to derive the real constituents of Science from the constitution of the cognitive faculty itself" (p. 56), and (b) the sensationalistic, which assumes that the mind is a *tabula rasa* passively receiving the essential forms of reality from the object. As against this it is urged that thought "is an activity which reproduces the activity of things, the activity in which the phenomena of nature arise" (p. 60). The problem of transcendence is solved if we but remember that in action "we are really *part* of a larger *whole.* Our exertional action is *ab initio* mingled in and forms an integral part of the dynamic system in which our life is involved" (p. 64). Sensation is explained as obstructed action, which is hence relational and not photographic in character (cf. pp. 62, 63).

In brief, the author seems to feel that the belief in an all-constituting energy, which is "an alogical, unextended thing-in-itself" (p. 118), somehow makes the problem of knowledge easy of solution. Just how this comes about the reviewer is unable to state. The author shows no real appreciation of historical solutions of the problem, nor does he make any effort to face the difficulties, in connection with this subject, which are before the philosophical public at the present time.

University of Illinois, B. H. BODE.

Human Motives. By JAMES JACKSON PUTNAM. Boston, Little, Brown & Co., 1915. pp. xvii+179.

In a little book of contributions to social and religious psychology a well-known authority on medical subjects turns his attention to those motivations of conduct which long years of keen observation and the more recent psychoanalytical investigations have revealed. He finds that the conflict of our rational and emotional impulses resolves itself into an interaction of two motives, the constructive and the adaptive. In their creative enterprises men are moved by aspirations which aim at personal gratification and advancement. These two general classes of motives have a historical development in the individual as well as in the race and lend themselves to study either by the rational method in terms of the philosophy of religion or by the genetic method in terms of psychoanalysis. While religious faith points to the presence of a group of ideals toward which man is constructively working and in terms of which he is acknowledging an obligation to a deity immanent in the universe, psychoanalysis shows the presence of unconscious tendencies which, if not properly controlled and guided, often militate against these natural aspirations.

An occasion is therefore given for sketching the history of the psychoanalytic movement and for an outline of its main principles, methods and aims. The reviewer feels that the exposition is here clearer and more adapted to the class of readers for which the *Mind and Health Series* was intended. Above all—and this is not commonly

done—the interpretation of the Freudian attitude, especially that of Freud himself, seems to be just and unbiased. With all that the author has previously said in the book about religion, he leaves the doctrines of Freud singularly free from religious or philosophical conceptions. In the chapter on the "educational bearings of psychoanalysis," the author emphasizes the fact that teachers and parents ordinarily cannot hope to become psychoanalysts, but they may study ways in which the main propositions of the method "can be applied to children at large, in the schoolroom and at home." He stands in agreement with Münsterberg when he indicates the harm which too much intimate conversation with children can do[1]; he suggests, however, that earnest inquirers should not be scornfully rebuked. Abnormalities are but prolonged or exaggerated forms of disturbance which occur in the normal mind in lesser degree, and are often caused by inhibitions of a social nature with no proper outlet for dissipation. In essentials the author's ideas are suggestive of those of Holt in a recently published volume on the same subject: psychoanalytical treatment is not so much a cure as a reëducation.[2]

The last two chapters are concerned with the problem of the readjustment of the inner life of the individual to his social and spiritual environment. The possibilities of individual achievement are surprisingly great; but are much curtailed if not rightly directed toward a larger and ever deepening influence on humanity.

CHRISTIAN A. RUCKMICH.

Sleep and Sleeplessness. By H. ADDINGTON BRUCE. Boston, Little, Brown & Co., 1915. pp. ix+219.

In the opening chapter, the causes of sleep are discussed. The author lays much stress on the experimental reports of Sidis, Verworn, and Huebel to the effect that sleep does not so much depend on physiological conditions as on a hypnoidal state of mind. Expressed in other words, "when we sleep, we do so because our consciousness is no longer stimulated by a sufficient variety of sensations to keep us in a waking state," or "variety itself has temporarily become monotonous, and we fall asleep." Coriat's criticism that the "diminution of peripheral stimuli from the muscles to the brain, produced by the act of muscular relaxation," is responsible for the initiation of sleep, is accepted because Coriat admits "that the muscular relaxation itself may result from a relaxation of attention." The author gives numerous and apt illustrations in support of his "monotony theory." His statements flatter psychology, but do they state the whole truth? Any simplification of scientific problems for the purpose of popular exposition must naturally make light of the difficulties involved. Sleep is more likely a psychophysical phenomenon; it may be considered from the side of mind, or of body. To say that mental conditions cause bodily conditions even indirectly, or *vice versa*, or to speak of causal conditions and of accompanying conditions, begs the whole question of interactionism.

Under the caption of *The Mind in Sleep*, with a wealth of appropriate, sometimes personal, examples, the theory that dreams may be caused by past experiences or by present stimuli, is outlined. The Freudian hypothesis of the 'wish complex' is indorsed with reservations.

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[1] Münsterberg, H. *Psychology and Social Sanity*, 1914. pp. 3ff.
[2] Holt, E. B. *The Freudian Wish*, 1915. pp. 100ff.

Dreams which have been interpreted in terms of supernatural influences are classified into four groups: (1) the inspirational dream, giving rise to unusual achievement; (2) the somnambulistic dream, in which difficult problems are solved; (3) the revelational dream, in which hidden objects are brought to light; and (4) the telepathic dream that conveys messages from a distance. These are all explained in terms of 'subconscious mentation' and 'subconscious perceptions.'

The last three chapters consider the disorders of sleep and the causes and treatment of sleeplessness. A note of warning is sounded with respect to the arousal of childish fears and the consequent danger of inciting nightmares and somnambulistic disturbances. Insomnia as a rule is nothing more than "a bad habit of mind" and is induced by emotional disturbances which can be avoided. The physical factors are again secondary to the psychical, and suggestion, in its various forms, is the best palliative medium.

The book abounds in that form of illustrative material which will appeal to the average person who reads the work for the sake of personal benefit to be derived. Also the general reader will learn much from its pages. In this way it will carry out its stated mission "to extend knowledge of the important discoveries affecting individual and social welfare." The only negative criticism which occurs to the reviewer is the natural one: that in the endeavor to give weight to the helpful suggestions the authority of psychology has been slightly overemphasized.

University of Illinois, CHRISTIAN A. RUCKMICH.

BOOK NOTES

The psychology of relaxation. By GEORGE THOMAS WHITE PATRICK. Boston, Houghton Mifflin, 1916. 280 p.

Professor Patrick has for many years been engaged upon this subject, and brings together here five of his studies with modifications up to date, viz., the psychology of play, of laughter, of profanity, of alcohol, and of war, four of these having been reprinted elsewhere but revised here. The general thesis, which is original with the author, is that play is not only relaxation but reversion to activities in which the race has been engaged in earlier times, or to the psychokinetic equivalent of these activities. This goes distinctly beyond Groos or anyone else in this field and greatly reinforces all the arguments for the practical uses of play in education.

A beginner's psychology. By EDWARD BRADFORD TITCHENER. New York, Macmillan, 1915. 362 p.

The author tries to give us here the kind of book he would have found useful when he was beginning the study of psychology, nearly thirty years ago. The book is almost entirely different from the author's older "Primer"; at least, he tells us, "There is change all through; every paragraph has been rewritten. The greatest change is, however, a shift of attitude; I now lay less stress than I did upon knowledge and more upon point of view." Most of our readers are familiar with the old edition, and the best we can do here is to give the topics of this book's twelve chapters: Psychology, what it is and what it does; sensation; simple image and feeling; attention; perception and idea; association; memory and imagination; instinct and emotion; action; thought; sentiment; self and consciousness; and dreaming and hypnosis.

The Yoga-system of Patañjali, or the ancient Hindu doctrine of concentration of mind. Translated from the original Sanskrit by JAMES HAUGHTON WOODS. (Harvard Oriental Series, ed. by Charles Rockwell Lanman, vol. 17.) Cambridge, Harvard University Press, 1914. 384 p.

This important work cannot fail to appeal strongly to psychologists, for the Yoga-system has come into great prominence in recent times. It gives us the ancient Hindu doctrine of the concentration of mind, embracing the mnemonic rules and their comment and explanation. A very valuable introduction of some thirty pages explains the reasons for taking up this work, its difficulties, and discusses authorship, comparison of philosophic concepts and their non-conformity with tradition, the date of the Sūtras, which is placed between 300 and 500 A. D., and, most valuable of all, a brief summary concerning (1) concentration, (2) means of attainment, (3) supernormal powers, and (4) isolation.

Fundamentals of sociology, with special emphasis upon community and educational problems. By EDWIN A. KIRKPATRICK. Boston, Houghton Mifflin Co. (c. 1916.). 291 p.

This book is intended as an introduction to the subject, and deals with the evolution of group action; biological view of human develop-

ment; a psychological view of behavior and needs; economic, protective, recreative, cultural, social, moral, religious, and educational needs and activities; elementary, intermediate, secondary and higher needs and activities. Finally he deals with the family as a social group and as an institution; the community and its functions; general, economic, protective, recreative, cultural, social, religious and educational community studies.

Who is insane? By STEPHEN SMITH. New York, Macmillan, 1916. 285 p.

In 1882 the author was appointed State Commissioner in Lunacy of New York. At that time the insane in custody were about twelve thousand. The author introduced a training school for attendants, a state commission in lunacy, the removal of the insane from county to state care. These reforms raised the standard of care and treatment throughout the state. The chief topics are, who is insane and what is insanity; critical periods of life predisposing to insanity; care and treatment; the lesson applied to the feeble-minded and criminal; and finally, a new constitution—the dawn of a better day, with one section on eugenics.

The effect of age on habit formation in the albino rat. By HELEN B. HUBBERT. (Behavior Monographs, Vol. 2, No. 6, 1915.) Cambridge, Henry Holt & Co. 55 p.

This is a valuable paper and shows that young rats learn the maze more readily than old ones, that the time increases with age, that the most rapid stage of habit formation occurs lower in the learning process of young animals than of older ones, that for young rats sex is negligible while among older ones the males learn more rapidly, that the absolute time for the females is lower than for the males, that there is no difference between night and day learning, that continued practice after the habit is learned does not increase final efficiency, and that the importance of adequate rest is plain.

Psychological effects of alcohol; an experimental investigation of the effects of moderate doses of ethyl alcohol on a related group of neuro-muscular processes in man. By RAYMOND DODGE and FRANCIS G. BENEDICT. With a chapter on free association in collaboration with F. Lyman Wells. Washington, Carnegie Institution, 1915. 281 p.

This is a very exhaustive and thorough-going study, with 32 illustrations, which, after describing the plan of the investigation, explains the effect of alcohol on the simplest neural arcs, then on complex ones, and in later chapters on free associations, process of memorizing, on the sensory threshold for faradic stimulation, on motor coördinations, on pulse-rate during mental and physical work experiments, while the last chapter is devoted to summaries and correlations.

La pensée et la polyglossie; essai psychologique et didactique. Par IZHAC EPSTEIN. Lausanne, Librairie Payot et Cie, n. d. 220 p.

This very interesting monograph discusses the effect of the knowledge of several languages upon the mother-tongue. The chapter headings, anglicized, are as follows: automatism in languages by polyglots; inner language and polyglottism; the negative influence of present factors favorable in a language; the auditive influence; intercalation; diverse identification of the same ideas in different lan-

guages; sequence of ideas; variation of interpretive activity; practical applications.

Individuality in organisms. By CHARLES MANNING CHILD. Chicago, University of Chicago Press (c. 1915). 213 p.

The chief topics are the problem; theories of organic individuality; metabolic gradients in organisms; physiological dominance in the process of individuation; the range of dominance, physiological isolation, and experimental reproduction; discussion, conclusions, and suggestions. It is the statement of the conceptions of the nature of organic individuality which have developed in the writer's mind during the last fifteen years as a result of investigating the simpler processes of reproduction in lower animals.

The American college; a series of papers setting forth the program, achievements, present status, and probable future of the American college. With introduction by William H. Crawford. New York, Henry Holt & Co., 1915. 194 p.

This is an admirable collection of recent important papers upon this subject by President Faunce of Brown, Professor Shorey of Chicago, Dean Haskins of Harvard, Professor Conklin of Princeton, Presidents Rhees of the University of Rochester, Thwing of Western Reserve, Finley of the University of the State of New York, Few of Trinity, Slocum of Colorado College, Meiklejohn of Amherst, and Commissioner Claxton.

The crowd in peace and war. By SIR MARTIN CONWAY. New York, Longmans, Green, 1915. 332 p.

This book deals with kinds and nature of crowds, crowd units, continuity, instincts, compellers, exponents, representatives, organization, relations to government, liberty and freedom, education, morals, religion, overcrowds, etc. Only the last five chapters are devoted to war, beginning with page 265, its cause and cure, contest of ideals, the crowd at war, the value of the crowd, and the just mean.

Einführung in die Psychologie. Von E. v. ASTER. Leipzig, B. G. Teubner, 1915. 119 p.

This work is divided into four parts: first, generalities on the essence of the psychic; second, sensation and perception; third, the life of *Vorstellung;* fourth, feeling and will. It seems an admirable little compend but the script is German, and even the largest font of type is small, and the other sizes are simply ruinous to the eyes.

Harvey's views on the use of the circulation of the blood. By JOHN G. CURTIS. New York, Columbia University Press, 1915. 194 p.

The author of this book has been well known for many years as an able professor of physiology in Columbia University, and he has made here an admirable study of his subject in twelve chapters, with four illustrations.

Honesty; a study of the causes and treatment of dishonesty among children. By WILLIAM HEALY. (Childhood and Youth Series, edited by M. V. O'Shea.) Indianapolis, Bobbs-Merrill Co. (c. 1915). 220 p.

This is an excellent and needed study, to which the author brings a number of years of rare opportunity and excellent training and

ability. The following heads of chapters will give the best idea of the nature of the book: age of moral development; home conditions and parental behavior;companionship; discipline; amusement and adventure; habits—mental, physical and social; physical conditions; abnormal mentality correlated with stealing; impulsions and obsessions.

Being well-born; an introduction to eugenics. By MICHAEL F. GUYER. (Childhood and Youth Series, edited by M. V. O'Shea.) Indianapolis, Bobbs-Merrill Co. (c. 1916). 374 p.

This is a valuable book by a very competent hand. The heads of the chapters are as follows: heredity; the bearers of the heritage; Mendelism; Mendelism in man; are modifications acquired directly by the body inherited; prenatal influences; responsibility for conduct; mental and nervous defects; crime and delinquency; race betterment through heredity, with glossary and references.

The rhythm of life. By CHARLES BRODIE PATTERSON. New York, Thomas Y. Crowell Co. (c. 1915). 303 p.

The more important chapters here are on music of other climes, energy motion—vibration, music and colour tones, colour values, music —a compelling power, joy rhythm—the dance, nature and art in singing, colour tonics, keynote to health—harmony, cosmic consciousness, prophets of the invisible, life's love melody, music and character, music and education, a refining influence, musical therapeutics. The volume moves largely within the domain of New Thought, to which it makes an important and interesting contribution.

The transfer effects of practice in cancellation tests. By MELVIN ALBERT MARTIN. (Archives of Psychology, No. 32, August, 1915.) New York, Science Press. 68 p.

After discussing previous investigations and descriptions of material and procedure, the writer treats, first, in the preliminary investigations, of reaction time and cancellation; under present investigation, he treats of practice and test material, and procedure; third, treatment of data in the practice and test series. Finally comes the interpretation of results, in terms of speed and accuracy of performance, when corrected for errors, with summary and general conclusions.

The intellectual status of children who are public charges. By J. L. STENQUIST, E. L. THORNDIKE and M. R. TRABUE. (Archives of Psychology, No. 33, September, 1915.) New York, Science Press. 52 p.

This book describes the children measured and the tests used, viz., the Stenquist test of mechanical ability, or construction test, the Trabue completion test, Binet-Simon and reading tests; the results; heredity versus environment as the cause of the low intellectual status of dependent children.

The relation of quickness of learning to retentiveness. By DARWIN OLIVER LYON. (Archives of Psychology, No. 34, January, 1916.) New York, Science Press. 60 p.

The writer first gives a brief history of the topic, then describes method, problem, material, scoring, classes of subjects tested, and finally gives his results in the form of tables, time of initial learning, interval between learning and reproduction, amount retained, intellectual standing, social standing, age, sex, with summary and recapitulation of the main results.

The overcoming of distraction and other resistances. By JOHN J. B. MORGAN. (Archives of Psychology, No. 35, February, 1916.) New York, Science Press. 84 p.

After a description of the apparatus, the experiments with time and accuracy records are explained, responses to noise, as shown by breathing, comparison of quiet and noisy periods with respect to effort, comparison of the effect of various noises, relative significance of changes in time and force, with general summary and conclusions.

Completion-test language scales. By MARION REX TRABUE. New York, Teachers College, Columbia University, 1916. 118 p.

This work is based upon completion tests from over thirteen thousand public school pupils, and was done under the guidance of Professor E. L. Thorndike. It deals with language scale A, additional language scales, and calculation of the difficulty of test sentences.

Educazione dei deficienti. By SANTE DE SANCTIS. Milano, Dottor Francesco Vallardi, n. d. 300 p.

After a chapter on nomenclature and classification, the author discusses individual defectives, various tests, physical and psychopathic, causes, intelligence, volition, types of abnormality, grades and scales, organization of a school for investigation of defectives and their education, intellectual and moral, with copious biographic notices.

The victorious attitude. By ORISON SWETT MARDEN. New York, Thomas Y. Crowell Co. (c. 1916). 358 p.

Of the sixteen chapters of this work the more important seem to be, doubt the traitor; making dreams come true; a new rosary; making yourself a prosperity magnet; the suggestion of inferiority; have you tried love's way; the triumph of health ideals; preparing the mind for sleep; how to stay young; our oneness with infinite life.

Patience Worth; a psychic mystery. By CASPER S. YOST. New York, Henry Holt & Co., 1916. 290 p.

Healy's "The Individual Delinquent." By F. L. WELLS. (Reprinted from the Psychological Bulletin, Vol. XII, No. 7, July 15, 1915.) p. 274-277.

Le mécanisme des phénomènes hystériques; esquisse d'une théorie psychophysiologique de l'hystérie. Par ALBERT SALMON. (Reprinted from Nouvelle Iconographie de la Salpêtrière, Nos. 3 and 4, 1915.) 16 p.

L'emozione; studie di psicologia generale. By ALBERTO SALMON. (Reprinted from Quaderni di Psichiatria, Vol. 11, No. 9-10.) 26 p.

Just be glad. By CHRISTIAN D. LARSON. New York, Thomas Y. Crowell Co. (c. 1912). 64 p.

On books and reading; outline of a course of lectures for nurses in hospitals. By EDITH KATHLEEN JONES. (Reprinted from American Journal of Insanity, Vol. LXXII, No. 2, October, 1915.) p. 297-303.

The hospital library—books for the patients. By EDITH KATHLEEN JONES. (Reprinted from The Modern Hospital, Vol. V, No. 4, October, 1915.) 12 p.

A brief bibliography of books in English, Spanish and Portuguese, relating to the republics commonly called Latin American, with comments. By PETER H. GOLDSMITH. New York, Macmillan, 1915. 107 p.

Thought-content and feeling. By KNIGHT DUNLAP. (Reprinted from the Psychological Review, Vol. XXIII, No. 1, January, 1916.) p. 49-70.

Color theory and realism. By KNIGHT DUNLAP. (Reprinted from the Psychological Review, Vol. XXII, No. 2, March, 1915.) p. 99-103.

A new measure of visual discrimination. By KNIGHT DUNLAP. (Reprinted from the Psychological Review, Vol. XXII, No. 1, January, 1915.) p. 28-35.

The shortest perceptible time-interval between two flashes of light. By KNIGHT DUNLAP. (Reprinted from the Psychological Review, Vol. XXII, No. 3, May, 1915.) p. 226-250.

Ricerche sperimentali sulle illusioni dell' introspezione. By ENZO BONAVENTURA. (Reprinted from Psiche, Vol. IV, Nos. 1, 2 and 3, 1915.) 133 p.

L'insegnamento della psicologia all' estero. By ENZO BONAVENTURA. (Reprinted from Bollettino della Associazione di Studi Psicologici, Vol. I, No. 4, and Vol. II, No. 1.) p. 69-100, and p. 1-10.

The academic status of psychology in the normal schools. Report of the committee on the academic status of psychology, American Psychological Association. Princeton, N. J., Printed by the Committee, December, 1915. 33 p.

A LABORATORY NOTE

Since the beginning of the present war, there has been more or less difficulty in having orders filled for apparatus or for parts of apparatus, ordered from German instrument firms. Hence the replenishing of the laboratory stock of such things as rubber sleeves for the Lehmann plethysmograph becomes rather of a problem.

We attempted to solve this, in the case of the rubber plethysmograph sleeve, by having a manufacturing rubber firm dip some sleeves especially for us from our own mold; but we were unable to find a firm who was willing to consider such a small order. Hence it became necessary for us to find a substitute for this form of rubber sleeve. The rubber surgical glove or the long rubber maternity glove at once suggest themselves. These, however, are both expensive and it will also be found that the subject can insert his hand and arm into the instrument only with a great deal of difficulty, even though a large sized glove is employed.

The bladder spinal ice bag was suggested to us, however, as a substitute for the rubber plethysmographic sleeve, and this proved to be an excellent substitute indeed. This bladder spinal ice bag is a long narrow rubber sac, without joints and closed at one end. The open end is reinforced by a double thickness of rubber and is hence slightly

narrower than the rest of the bag. Hence we have here a seamless rubber bag of almost identical shape to the customary sleeve. This bladder spinal ice bag is not to be confounded with the laced spinal ice bags of English design.

Bladder spinal ice bags, indeed, recommend themselves for constant use with the Lehmann plethysmograph. They are very quickly and readily obtainable, and indeed, are kept constantly in stock by any first-class wholesale rubber or drug firm. Hence the laboratory need not lay in a large supply which may rot before use. The slightly narrowed open end of the bladder spinal ice bag fits over the open end of the metal sleeve so tightly that there is small likelihood of leakage at this point. Furthermore the walls of this ice bag are slightly thinner than those of the customary sleeve and hence should give a more delicate record. Finally, the bladder spinal ice bag recommends itself for use by the small price for which it may be purchased; a price usually ranging from 30 to 40 cents apiece. S. W. F.

Oswald Külpe, 1862-1915. The death is announced, at the age of fifty-three years, of Professor Külpe of Munich, equally well known to psychologists and philosophers because of his many publications in both fields. Külpe's elementary text-books of psychology and of the history of philosophy are very widely read and each has gone through a number of editions. He has contributed very greatly to the theory and practice of introspection, and is, indeed, the father of the so-called Wurzburg method which grew under his direction while he was professor at the University of Wurzburg, and which has contributed so largely to the imageless thought movement. At the present time Professor Külpe was re-writing his *Grundriss der Psychologie* from this point of view. Among his published works are: *Grundriss der Psychologie*, 1893; *Einleitung in die Philosophie*, 1895; *Welche Moral ist heutzutage die beste?* 1900; *Die Philosophie des Gegenwart in Deutschland*, 1904; *Immanuel Kant, Darstellung und Würdigung*, 1907; *Erkenntnistheorie und Naturwissenschaft*, 1910; *Psychologie und Medizin*, 1912; *Die Realisierung: ein Beitrag zur Grundlegung der Realwissenschaften*, 1912. A selection of some of Külpe's more important articles show his tremendous breadth of interests: *Zur Theorie der sinnlichen Gefühle*, 1887; *Aussichten der experimentellen Psychologie*, 1894; *Zur Lehre von der Aufmerksamkeit*, 1897; *Ueber den associativen Faktor des ästhetischen Eindrucks*, 1899; *Zur Frage nach der Beziehung der ebenmerklichen zu den übermerklichen Unterschieden*, 1902; *Ueber die Objektivirung und Subjektivirung von Sinneseindrücken*, 1902; *Ein Beitrag zur experimentellen Aesthetik*, 1903; *Ueber die Beziehungen zwischen körperlichen und seelischen Vorgängen*, 1908; *Pour la psychologie du sentiment*, 1910; *Contribution to the History of the Concept of Reality*, 1912; *Ueber die moderne Psychologie des Denkens*, 1912.